1992

PERFORMANCE REPORT

Drinking Water Organics Section

Eva Duchoslav (ed.)
Drinking Water Analyses Section
Laboratory Services Branch
Ministry of Environment and Energy

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ACKNOWLEDGEMENT

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INTRODUCTION

This document provides the 1992 summary of the performance of routine approved analytical methods within the laboratories of the former Drinking Water Organics Section (DWO), namely the Dioxin Unit, the Mass Spectrometry Unit, the Organic Water Unit and the Priority Pollutants Unit.

In December 1992 the Laboratory Services Branch was reorganized. The Plasma Spectrometry/ Trace Metals Unit was added to the Drinking Water Organics Section and to form the Drinking Water Analyses Section (DWA).

The Drinking Water Analyses Section is responsible for both qualitative and quantitative analyses of drinking, surface, river and lake waters for trace metals, major elemental components and a wide array of organic chemicals, such as chlorinated benzenes, herbicides, pesticides, polynuclear aromatic hydrocarbons, extractable organics and purgeable organics at the part-per-trillion or part-per-billion level. In addition, analyses provided by the Section include ultra-trace quantitative analyses of all environmental matrices for polychlorinated dibenzodioxins and polychlorinated dibenzofurans, most notably 2,3,7,8-tetrachlorodibenzo-p-dioxin.

The major objective of the DWA Section's quality assurance program is to produce data of known quality, appropriate to the particular project requirements. The quality of the data is to be supported by documentation acceptable to scientific community, and garthered in accordance with the established ministry protocols. The quality control program is designed to detect any anomalies in the quality of the analytical results and to provide the basis for an immediate corrective action.

Within the DWA Section, the most common quality control tasks include the analyses of quality control samples, such as method blanks, fortified method blanks, samples fortified with surrogates, check calibration solutions and reference materials, and the interpretation of the resulting data. For each analytical method, the actual quality control procedures are described in detail in the official method text.

This Performance Summary Report is based on the results of selected quality control samples acquired in the Drinking Water Organics Section between January and December, 1992. In this report, each abstract of the analytical method is accompanied by corresponding performance charts and summary tables. Performance charts indicate the mean and the 99%-confidence limits for the variable presented.

The Plasma Spectrometry / Trace Metals Unit was incorporated into the DWA at the end of 1992 and therefore, data from this Unit is not reported here.

GLOSSARY OF TERMS

accuracy	proximity to the true value expressed as average percent recovery or average percent of expected
average (mean)	sum of the measurements divided by the number of measurements
between-run experiment	samples are prepared by different technicians, and the instrumental analyses take place under different calibrations of the analytical system
between-run r.s.d.	measure of reproducibility of a method
calibration solution	a solution containing target analyte(s) for a particular method at concentration(s) that will produce response(s) falling within the linear range of the instrument. This solution is used to calibrate the instrument response with respect to the analyte concentration.
calibration check solution	a solution of a composition similar to the calibration solution, prepared independently of the calibration solution. It is used to check performance of the instrument, especially, the validity of current calibration.
fortified method blank	a synthetic sample prepared by adding known quantities of the analytes of interest to the interference-free matrix
IDL	instrumental detection limit. The concentration giving an instrumental response of 5:1 signal-to-noise height ratio.
internal standard	a known amount of a compound, that is assumed to have identical chemical and physical properties with the analyte(s) of interest, is added to the sample prior to sample processing. The recovery of this compound from the sample is used for correction of the final results.
MDL	method detection limit. MDL marks the concentration level above which one can conclude that a measured result indicates the presence of analyte in the sample with a specified confidence (99%).
method code	Analytical Methods Catalogue Code used within Ontario Ministry of the Environment
percent recovery	ratio of the concentration obtained by the experiment to the theoretical concentration, multiplied by one hundred

performance charts	graphical presentation of the individual results of the analyses of fortified method blanks. The x-axis on the chart represents the date, the y-axis outlines percent recovery. The average and 99% confidence limits are displayed as well.
standard deviation	measure of spread of a population. The square root of the squared sum of the measurements minus the sum of squared measurements, divided by the number of measurements minus one.
T value	level below which analytical results represent trace values; additional data are needed for valid interpretation (see Code of Practice for Environmental Laboratories, September 1989, Ontario Ministry of the Environment)
upper and lower 99% confidence limit, UL (LL)	UL (LL) = X + (-) t x s X,s represent the average and the standard deviation of the replicate measurement; $t_{(n-1,\alpha=0.01)}$ is the Student's t-value appropriate for a 99% confidence level and the given number of degrees of freedom n
within-run experiment	samples are prepared and analyzed by a single technician, and the instrumental analyses take place within one calibration of the analytical system
within-run r. s. d.	measure of repeatability of a method
W value	minimum reported level (see Code of Practice for Environmental Laboratories, September 1989, Ontario Ministry of the Environment)

METHOD CODE : OPOV-E3144B
METHOD TITLE: The Determination of Volatile Organic Compounds in Raw and Treated Drinking Water by Dual Capillary Column Dual FID / Purge and Trap Gas Chromatography

LABORATORY : Priority Pollutants Unit
SUPERVISOR : Dr. W. Berg

SAMPLE TYPE : raw and treated drinking water, surface water, groundwater

PRINCIPLE OF THE METHOD :

Volatile organic compounds in water are determined by purge-and-trap technique, followed by dual capillary column gas chromatography with dual flame ionization detection. The volatile organic compounds are purged from the sample with helium at room temperature onto an adsorbent trap. The compounds are then thermally desorbed and, prior to being introduced to the gas chromatograph, are focused cryogenically with liquid nitrogen. Target compounds are quantified by an external standard calibration method.

PARAMETERS MEASURED :	**LIS TEST CODE**	**W (µg/L)**	**T (µg/L)**
vinyl chloride	X1022P	0.05	0.5
1,1-dichloroethene	X1001P	0.05	0.5
dichloromethane	X1002P	0.5	5.0
trans-1,2-dichloroethene	X1003P	0.05	0.5
1,1-dichloroethane	X1004P	0.05	0.5
cis-1,2-dichloroethene	X1CDCE	0.05	0.5
chloroform	X1005P	0.1	1.0
1,1,1-trichloroethane	X1006P	0.05	0.5
1,2-dichloroethane	X1007P	0.1	1.0
carbon tetrachloride	X1008P	0.2	2.0
benzene	B2001P	0.05	0.5
1,2-dichloropropane	X1009P	0.05	0.5
trichloroethylene	X1010P	0.05	0.5
bromodichloromethane	X1011P	0.2	2.0
toluene	B2002P	0.05	0.5
1,2-dibromoethane	X2EDB	0.1	1.0
1,1,2-trichloroethane	X1012P	0.1	1.0
dibromochloromethane	X1013P	0.2	2.0
tetrachloroethene	X1014P	0.05	0.5
chlorobenzene	X2001P	0.05	0.5
ethylbenzene	B2003P	0.05	0.5
m-xylene	B2005P	0.05	0.5
p-xylene	B2004P	0.05	0.5
bromoform	X1015P	0.5	5.0

(parameters measured continued)

styrene	B2008P	0.05	0.5
o-xylene	B2006P	0.05	0.5
1,1,2,2-tetrachloroethane	X1016	0.1	1.0
1,4-dichlorobenzene	X2002P	0.05	0.5
1,3-dichlorobenzene	X2003P	0.05	0.5
1,2-dichlorobenzene	X2004P	0.05	0.5
total trihalomethanes	X2TTHM	0.5	5.0

REPORTING FORMAT :

Results are reported in parts per billion (µg/L) rounded off to the closest increment of W and up to maximum of three significant figures.

QUALITY CONTROL :

The routine quality control operations monitor absence of potential interferences (method blanks) and consistency with the predetermined method performance (fortified method blanks). The control limits for the percent recovery of the target analytes from the fortified method blanks are set at 85% and 115%.

REMARKS : In addition to the intra-laboratory method control, the performance of the method was examined through performance audit samples program organized by LSB QM Office.

In 1992, the method participated in the VCM+BTX Roundrobin Study (E690) organized by Esso Chemical Canada and in the Smithville Tender Intercomparison Study organized by the Laboratory Services Branch.

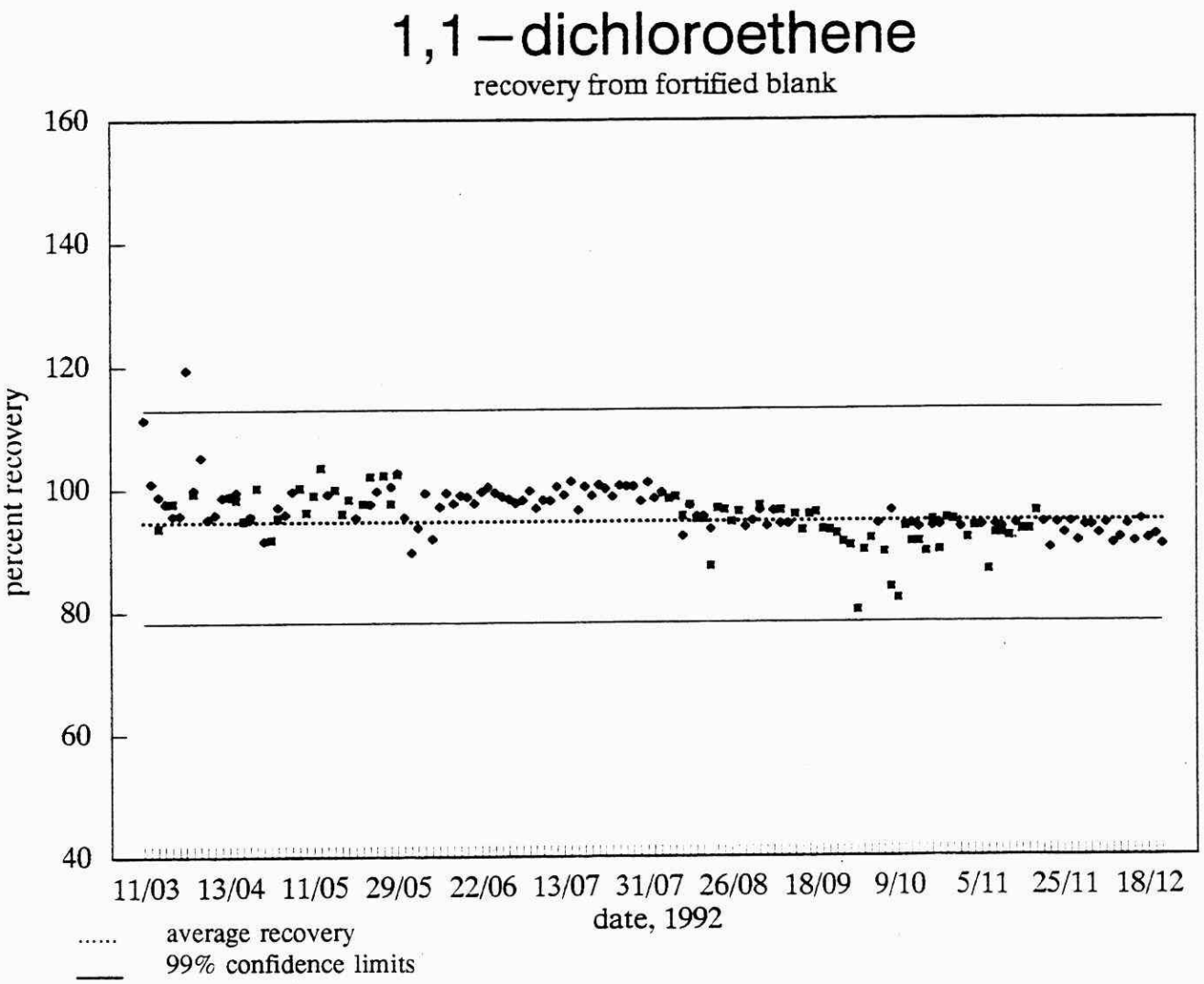
List of Performance Charts : all analytes, except vinyl chloride and cis-1,2-dichloroethene, described as parameters measured (recoveries from fortified blanks)

List of Performance Tables : Method Blanks Summary
all analytes, except vinyl chloride and cis-1,2-dichloroethene, described as parameters measured

Method Blanks Summary January 1992 - December 1992

Analyte	Number of Observations	Average Concentration (µg/L)	Standard Deviation (µg/L)
vinyl chloride	363	ND (0.02)	
1,1-dichloroethene	363	0.0002	0.0023
dichloromethane	363	0.44	0.52
trans-1,2-dichloroethene	363	ND (0.02)	
1,1-dichloroethane	363	ND (0.02)	
cis-1,2-dichloroethene	363	ND (0.02)	
chloroform	363	0.01	0.29
1,1,1-trichloroethane	363	0.0002	0.0024
1,2-dichloroethane	363	0.00003	0.00043
carbon tetrachloride	363	ND (0.01)	
benzene	363	0.0048	0.0062
1,2-dichloropropane	363	ND (0.02)	
trichloroethene	363	0.0004	0.0038
bromodichloromethane	363	0.002	0.022
toluene	363	0.010	0.020
1,2-dibromoethane	363	ND (0.1)	
1,1,2-trichloroethane	363	ND (0.05)	
dibromochloromethane	363	ND (0.2)	
tetrachloroethene	363	ND (0.04)	
chlorobenzene	363	0.00004	0.00055
ethylbenzene	363	0.0006	0.0023
m-xylene / p-xylene	363	0.005	0.019
bromoform	363	0.002	0.0029
styrene	363	0.0003	0.0021
o-xylene	363	0.0011	0.0044
1,1,2,2-tetrachloroethane	363	0.011	0.072
1,4-dichlorobenzene	363	0.0022	0.0082
1,3-dichlorobenzene	363	0.003	0.012
1,2-dichlorobenzene	363	0.0023	0.009

ND ... Not detected. Detection limit in µg/L given in brackets ( ).

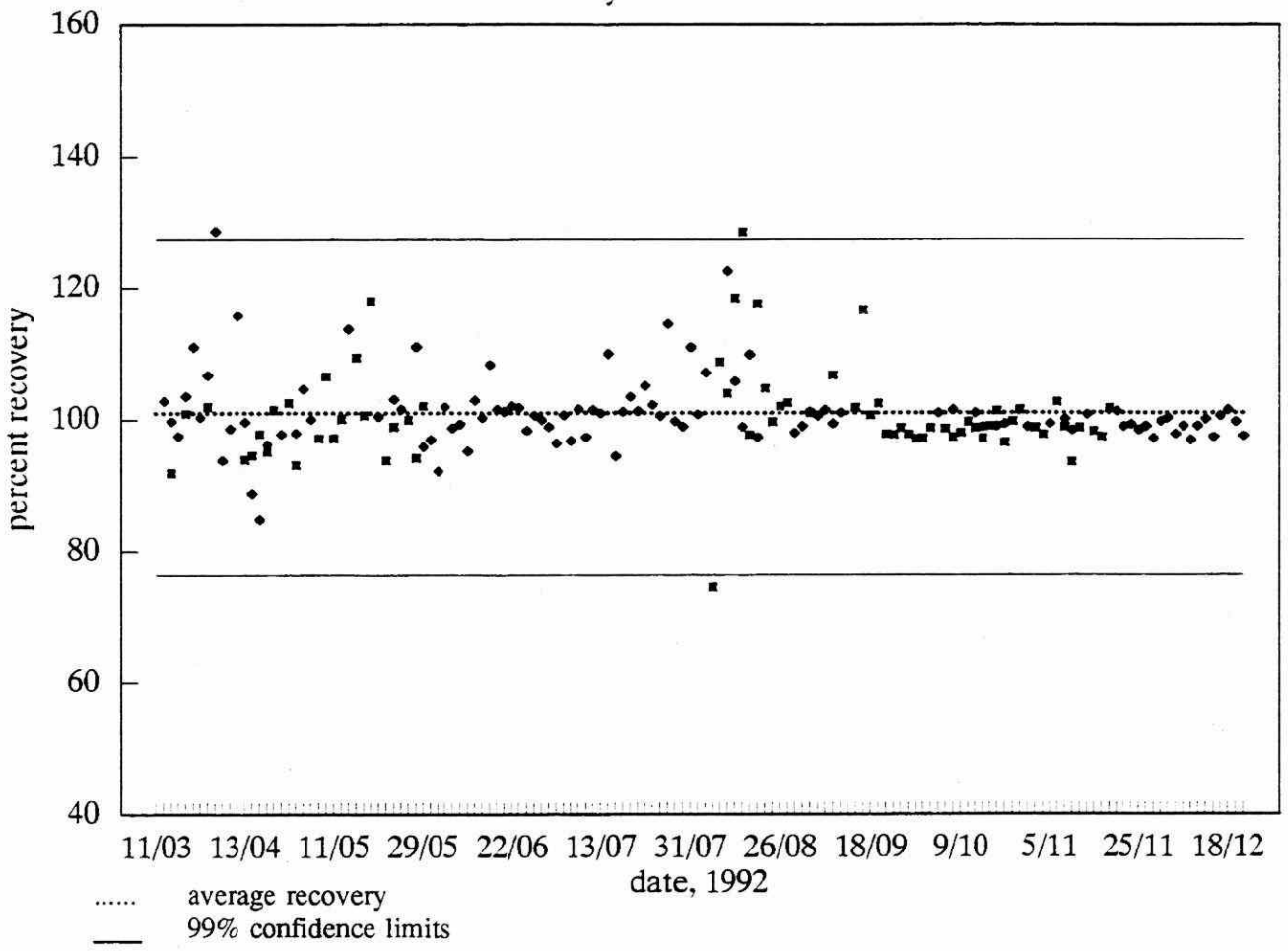


Performance Summary Table January - December 1992

Analyte	1,1-dichloroethene
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	0.8% (n=7)
Between-run Standard Deviation	6.8%
Accuracy (% of expected)	95.6%

dichloromethane

recovery from fortified blank

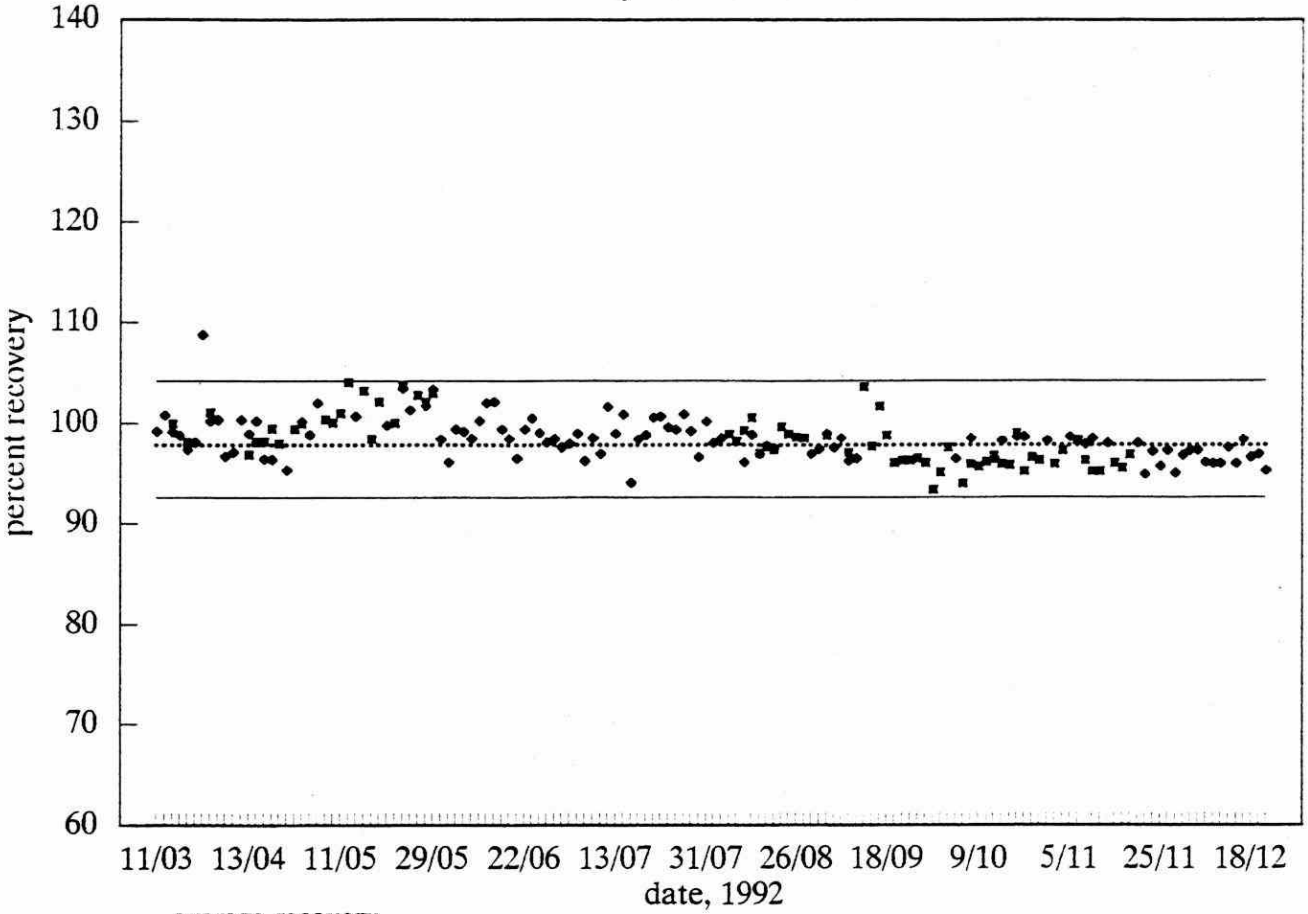


Performance Summary Table January - December 1992

Analyte	dichloromethane
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	2.2% (n=7)
Between-run Standard Deviation	10%
Accuracy (% of expected)	102%

t–1,2–dichloroethene

recovery from fortified blank

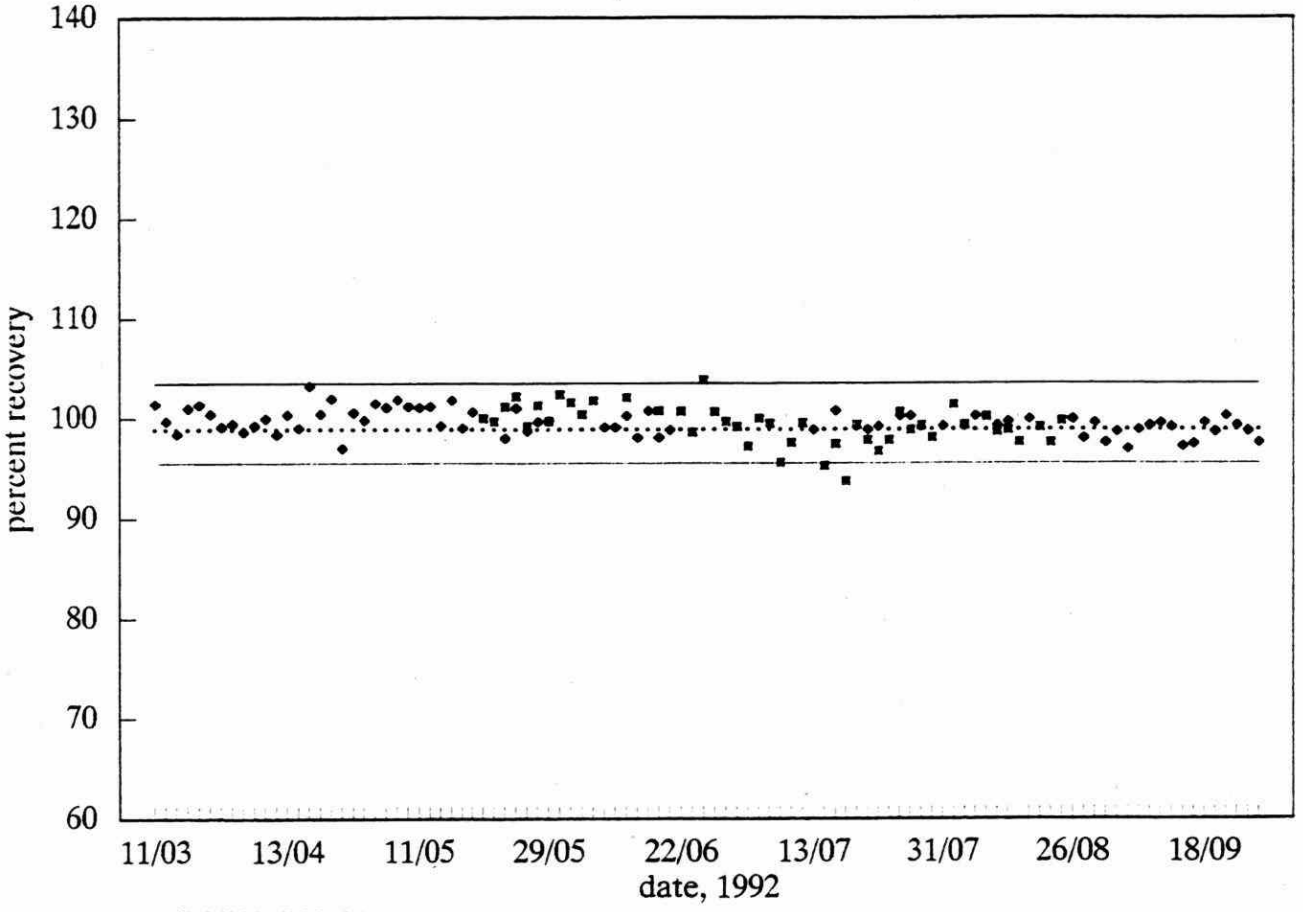


Performance Summary Table January - December 1992

Analyte	trans-1,2-dichloroethene
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	1.1% (n=7)
Between-run Standard Deviation	2.3%
Accuracy (% of expected)	98.4%

1,1–dichloroethane

recovery from fortified blank

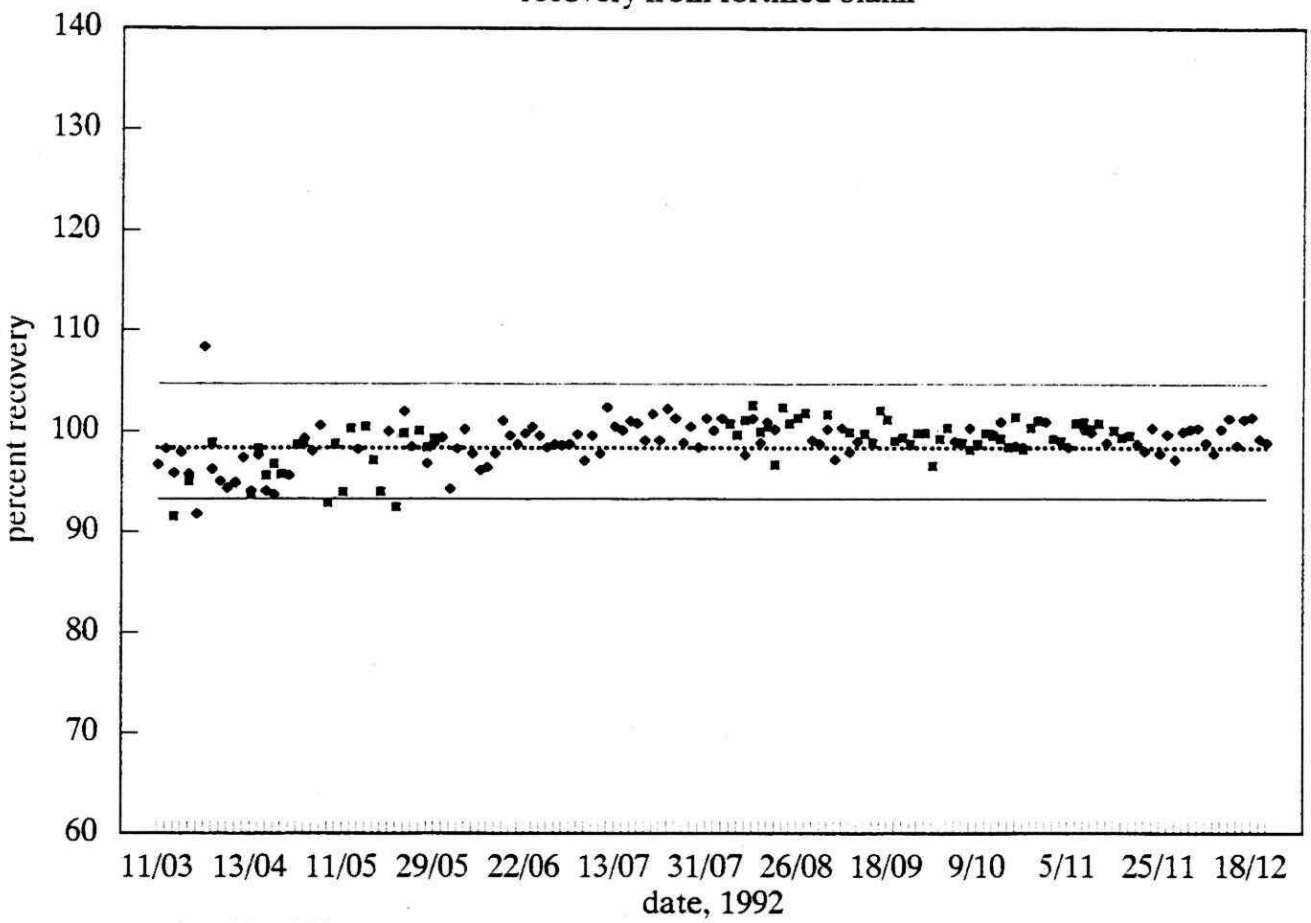


Performance Summary Table January - December 1992

Analyte	1,1-dichloroethane
True Concentration	3.68 µg/L
Number of Observations	116
Within-run Rel. Standard Deviation	1.1% (n=7)
Between-run Standard Deviation	1.6%
Accuracy (% of expected)	99.5%

chloroform

recovery from fortified blank



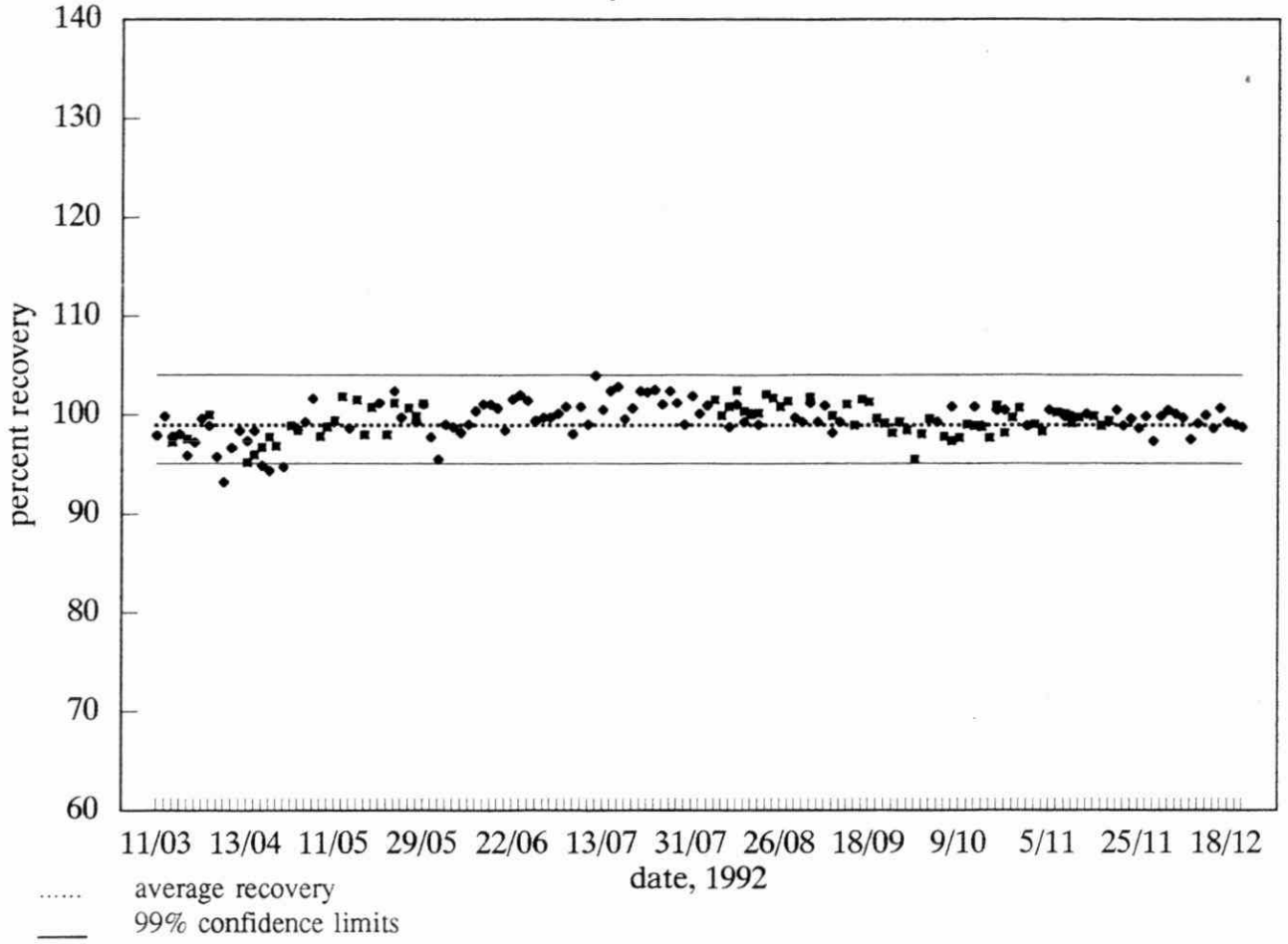
..... average recovery
___ 99% confidence limits

Performance Summary Table January - December 1992

Analyte	chloroform
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	2.5% (n=7)
Between-run Standard Deviation	2.2%
Accuracy (% of expected)	99.0%

1,1,1 – trichloroethane

recovery from fortified blank

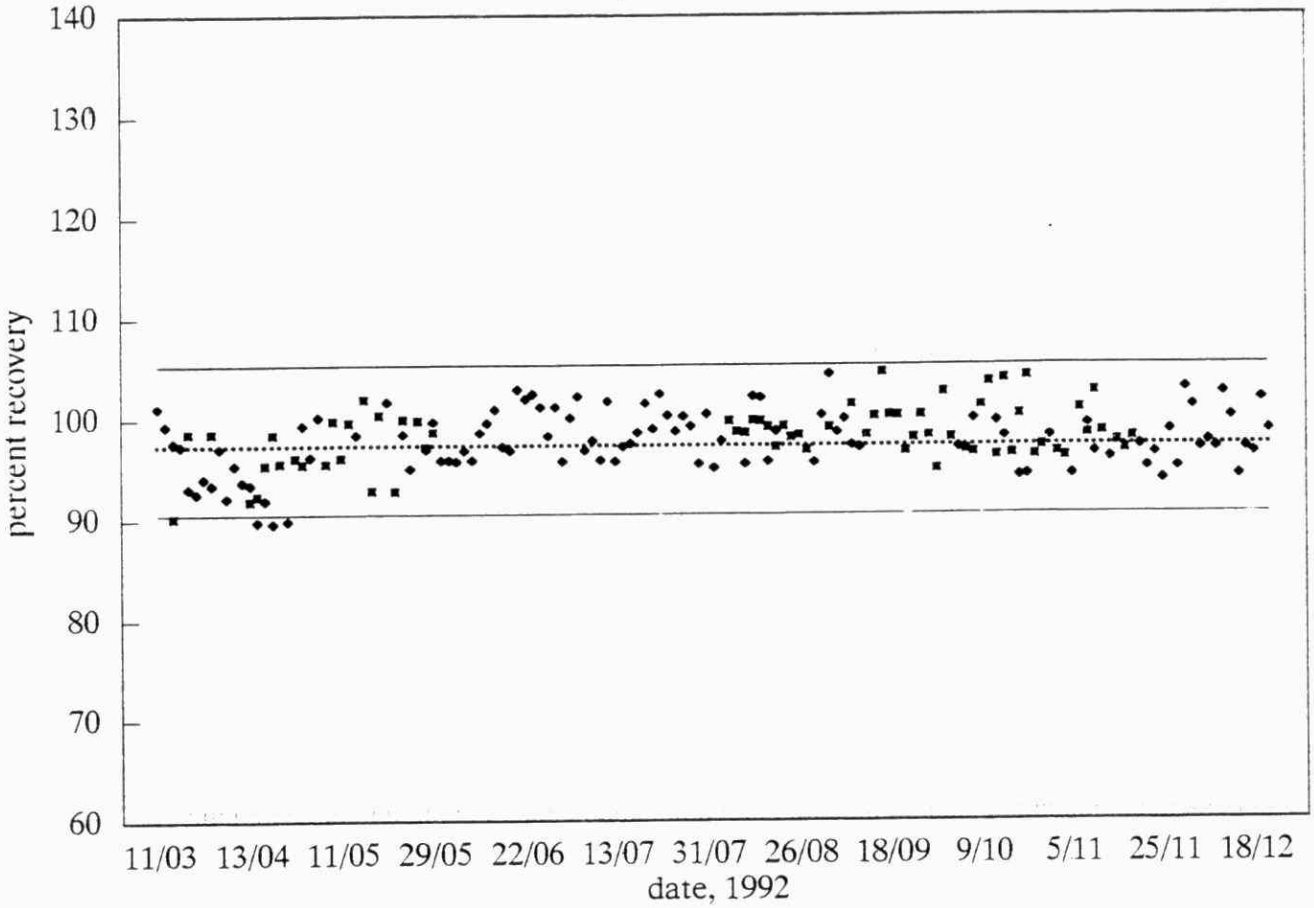


Performance Summary Table January - December 1992

Analyte	1,1,1-trichloroethane
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	1.1% (n=7)
Between-run Standard Deviation	1.8%
Accuracy (% of expected)	99.5%

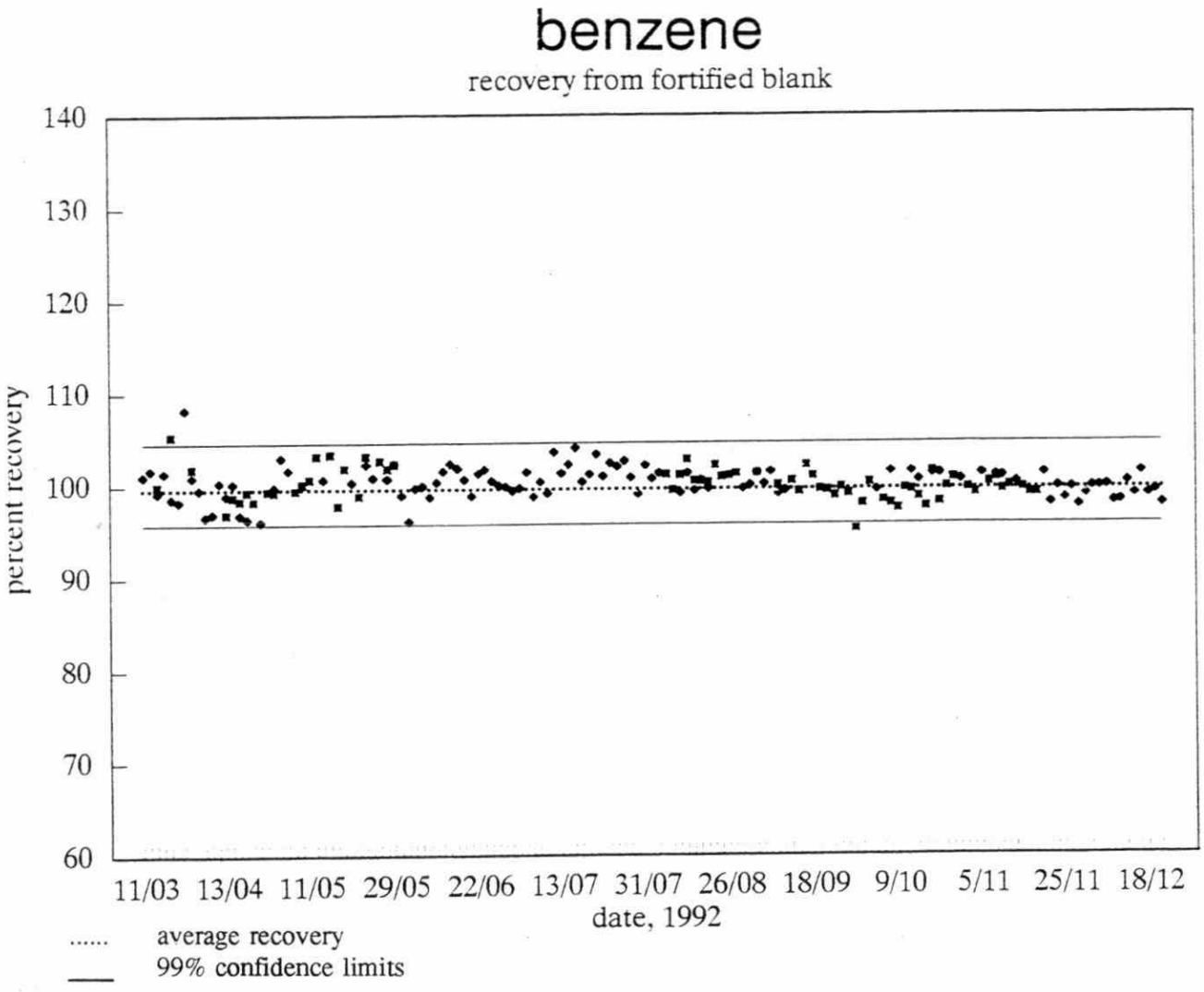
tetrachloromethane

recovery from fortified blank



Performance Summary Table January - December 1992

Analyte	tetrachloromethane
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	1.8% (n=7)
Between-run Standard Deviation	2.9%
Accuracy (% of expected)	97.9%

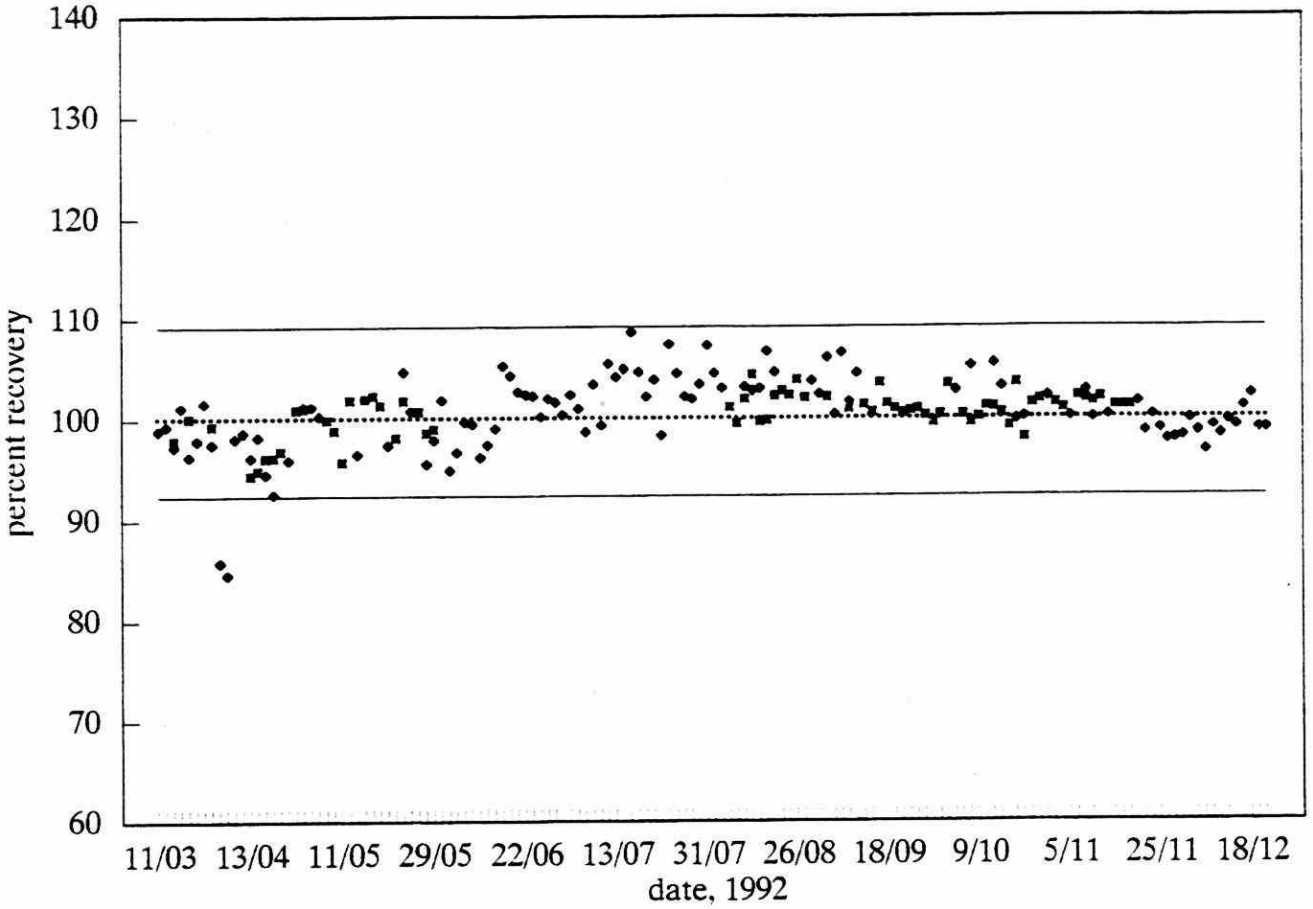


Performance Summary Table January - December 1992

Analyte	benzene
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	1.1% (n=7)
Between-run Standard Deviation	1.7%
Accuracy (% of expected)	100.2%

1,2–dichloroethane

recovery from fortified blank



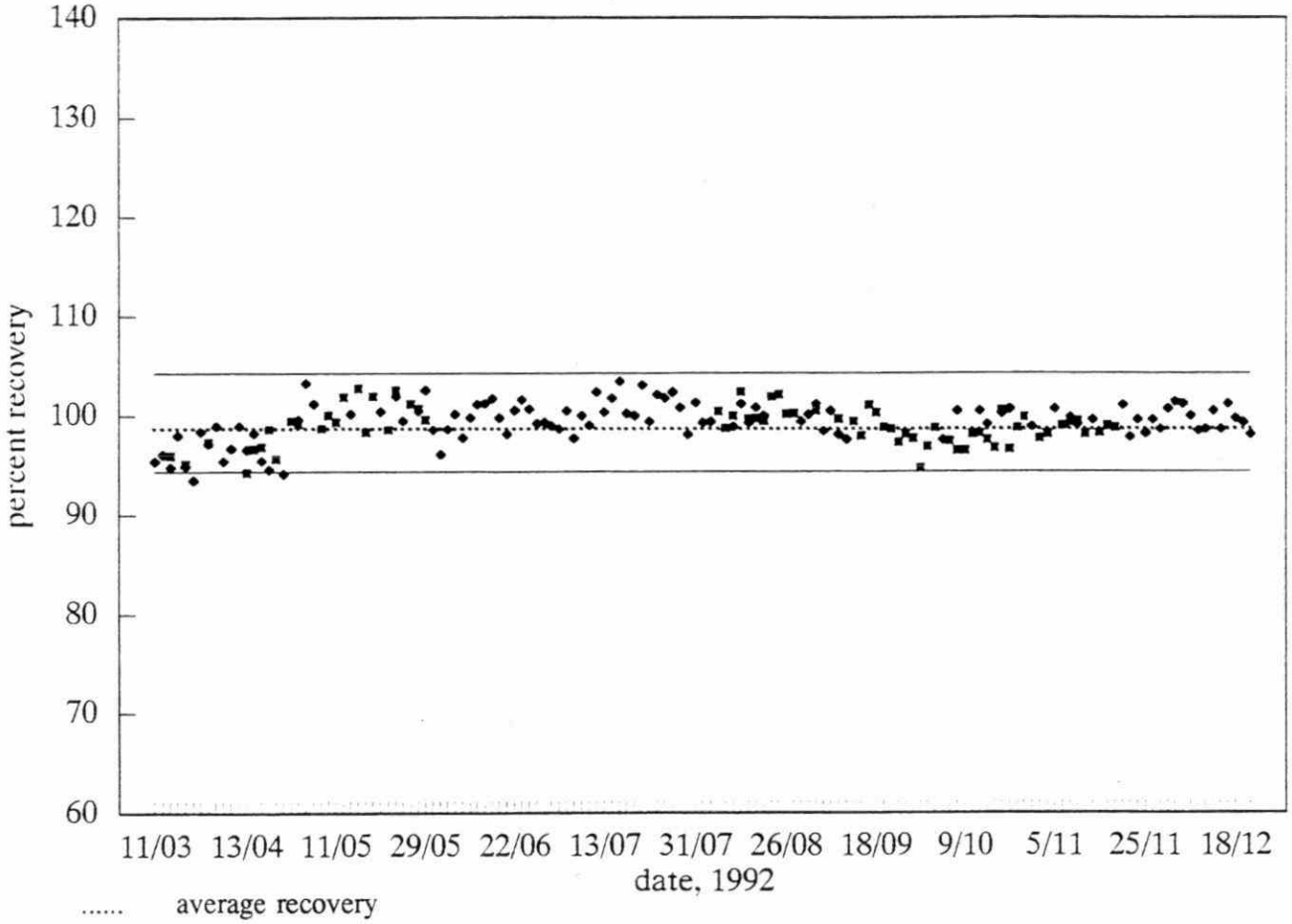
..... average recovery
___ 99% confidence limits

Performance Summary Table January - December 1992

Analyte	1,2-dichloroethane
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	2.4% (n=7)
Between-run Standard Deviation	3.3%
Accuracy (% of expected)	100.8%

trichloroethene

recovery from fortified blank

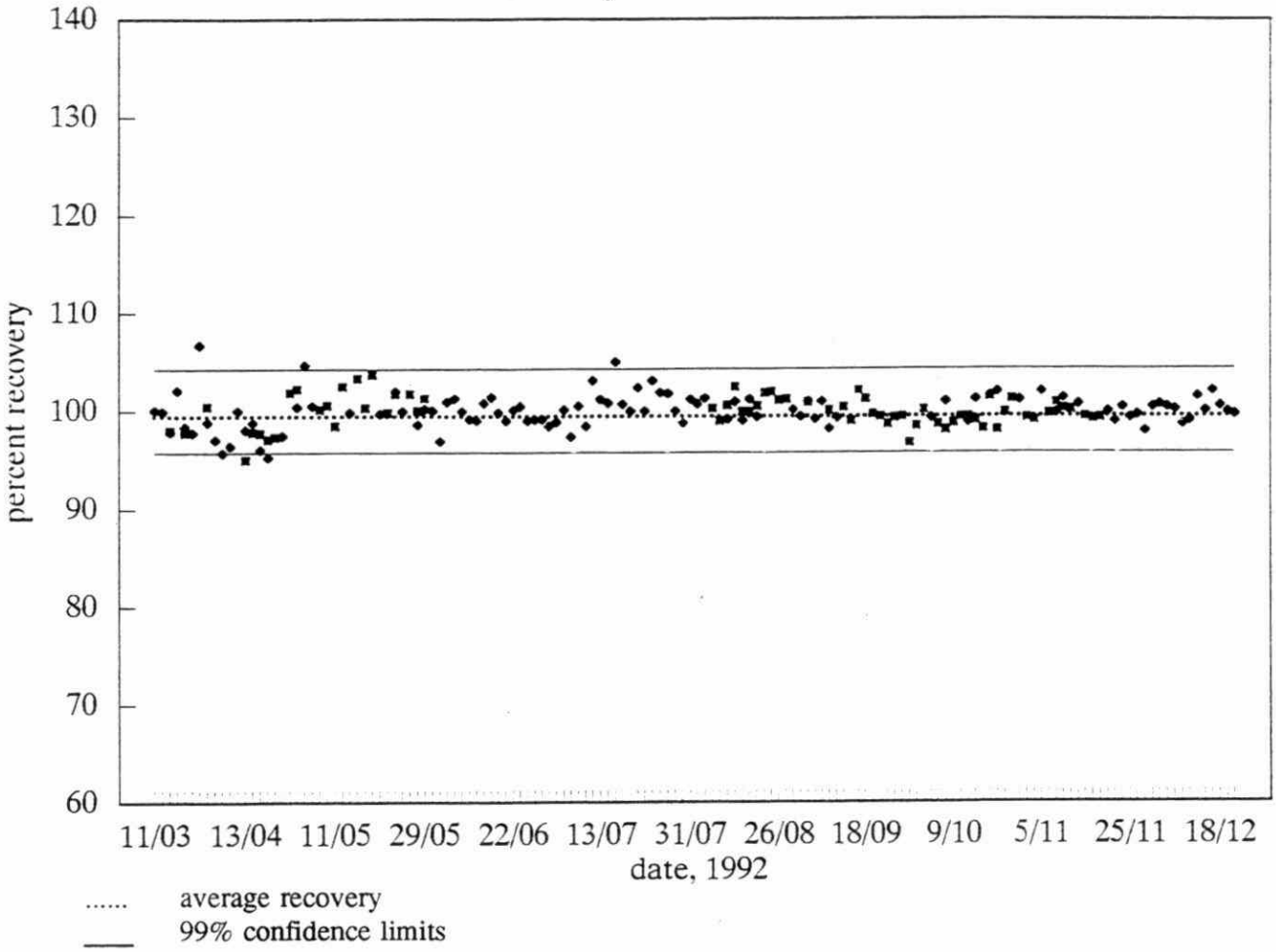


Performance Summary Table January - December 1992

Analyte	trichloroethene
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	1.3% (n=7)
Between-run Standard Deviation	1.9%
Accuracy (% of expected)	99.3%

1,2–dichloropropane

recovery from fortified blank

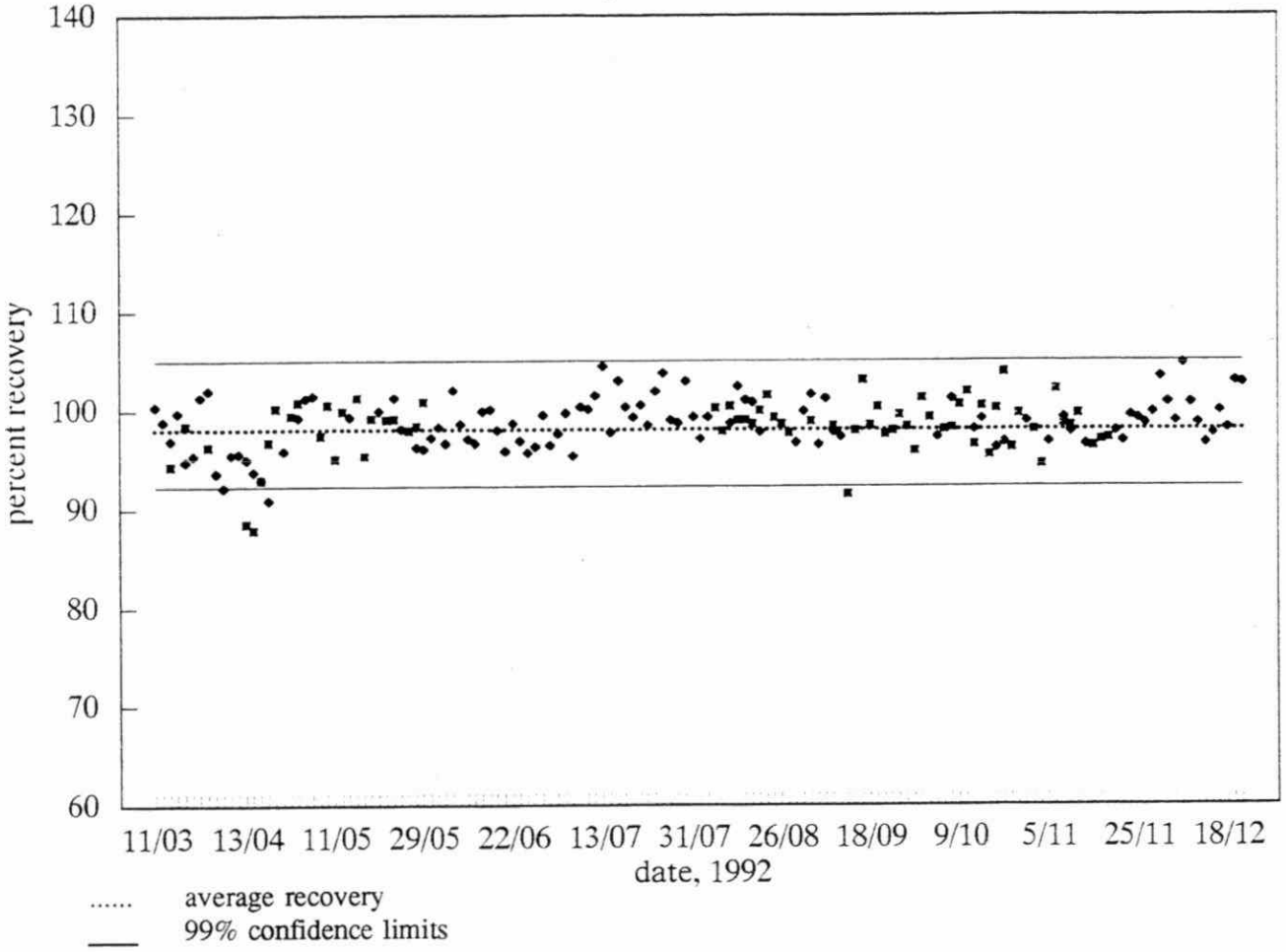


Performance Summary Table January - December 1992

Analyte	1,2-dichloropropane
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	1.3% (n=7)
Between-run Standard Deviation	1.7%
Accuracy (% of expected)	100.0%

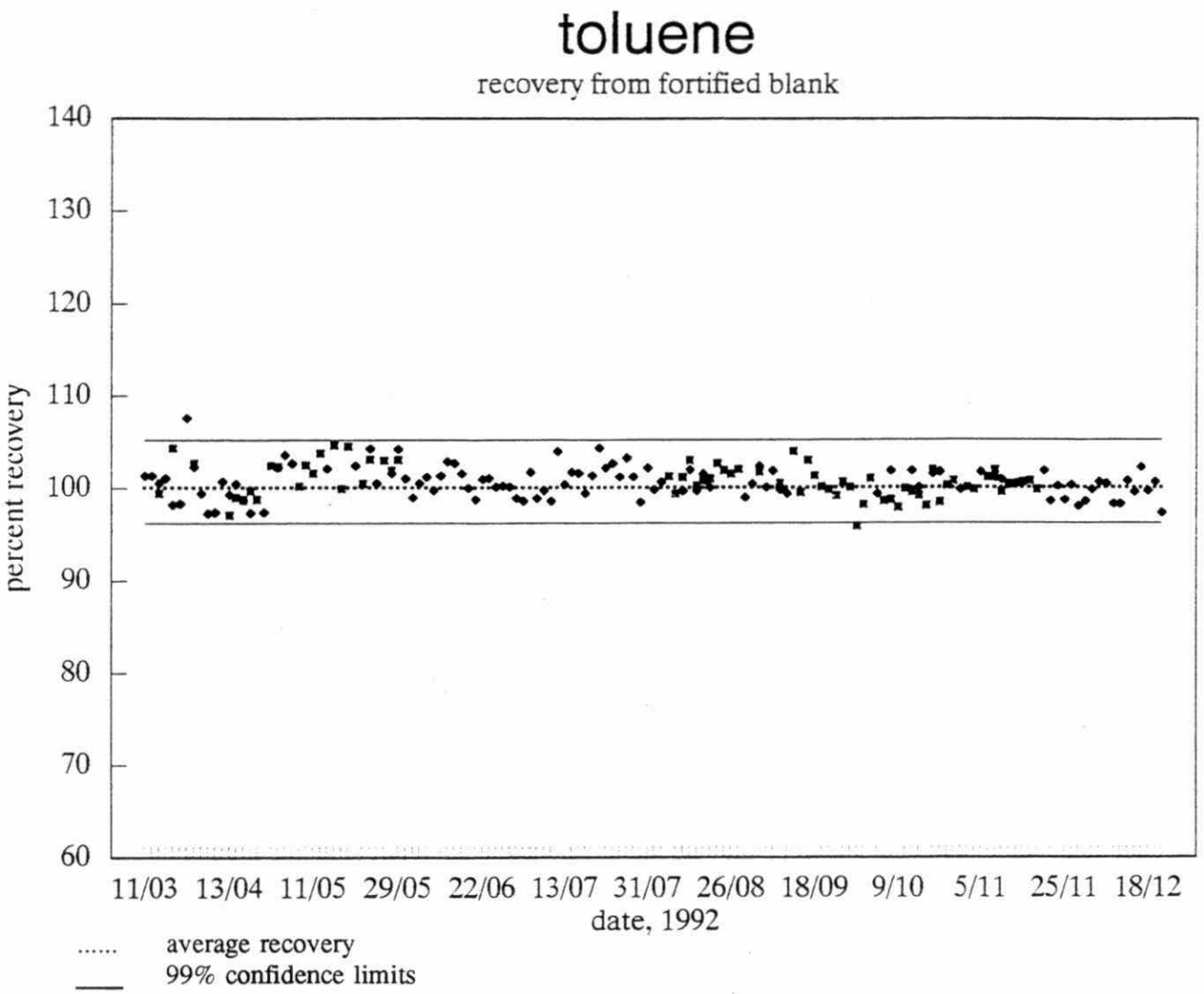
bromodichloromethane

recovery from fortified blank



Performance Summary Table January - December 1992

Analyte	bromodichloromethane
True Concentration	5.52 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	1.3% (n=7)
Between-run Standard Deviation	2.5%
Accuracy (% of expected)	98.7%

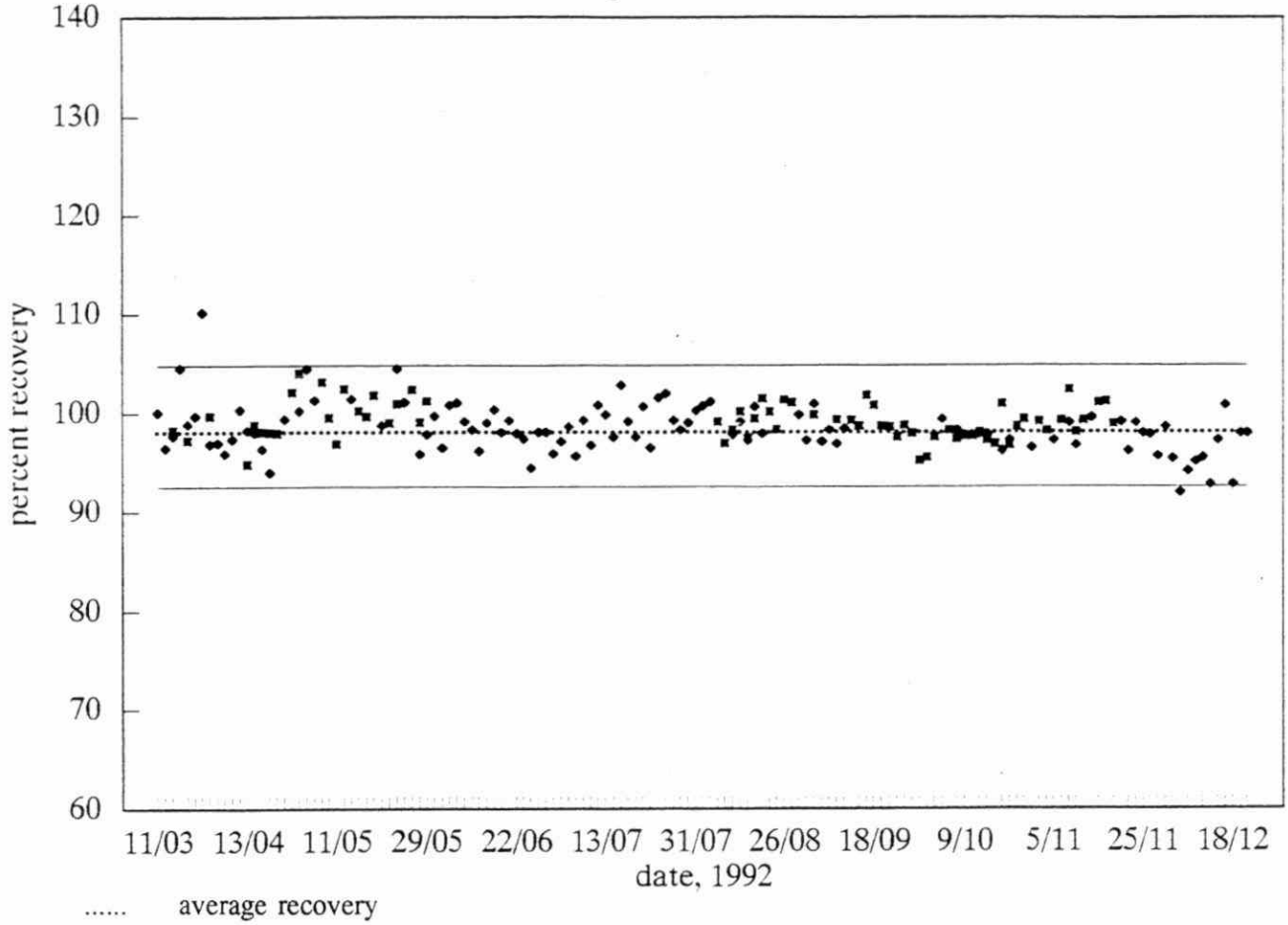


Performance Summary Table January - December 1992

Analyte	toluene
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	1.0% (n=7)
Between-run Standard Deviation	1.8%
Accuracy (% of expected)	100.8%

1,1,2–trichloroethane

recovery from fortified blank



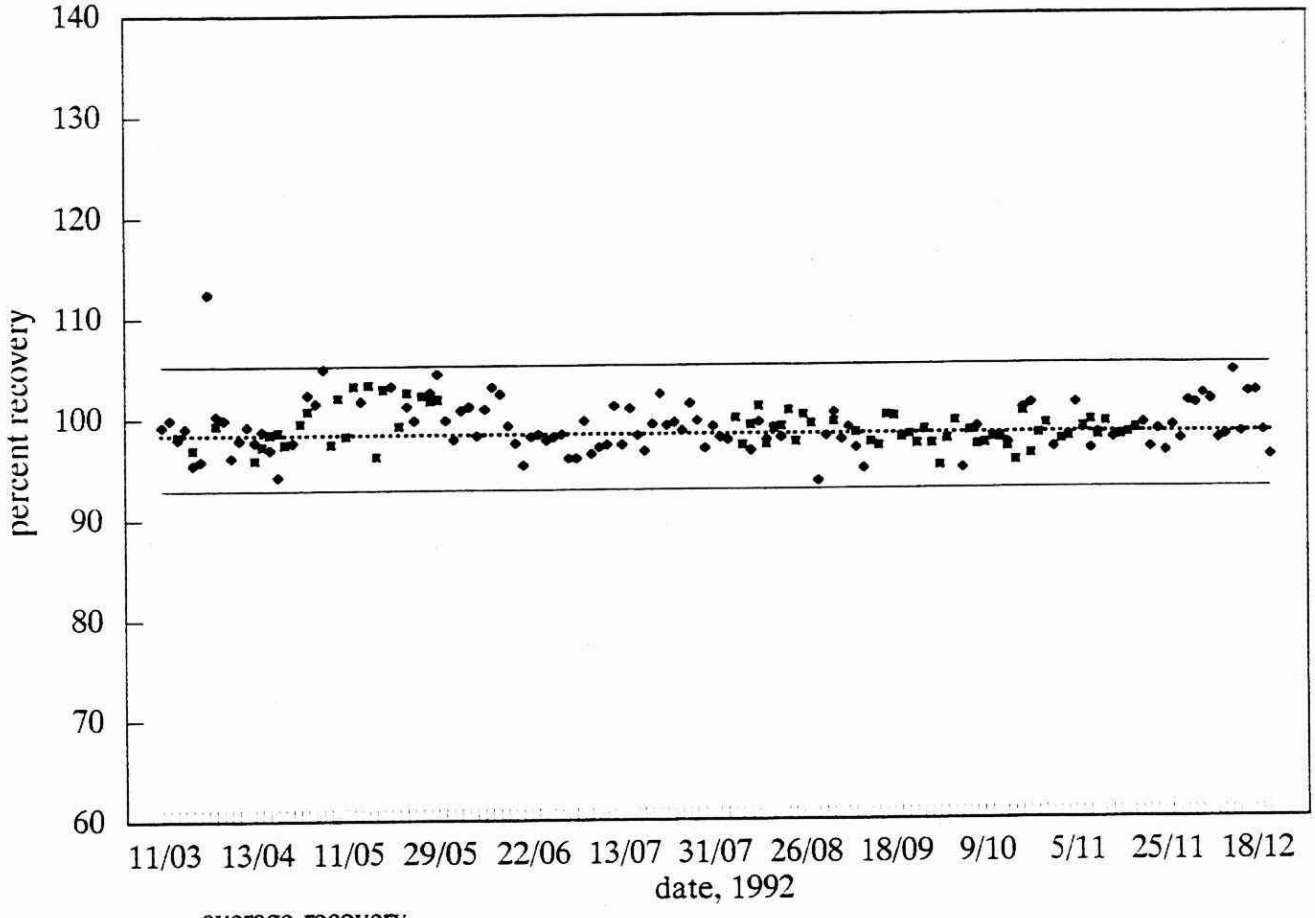
..... average recovery
___ 99% confidence limits

Performance Summary Table January - December 1992

Analyte	1,1,2-trichloroethane
True Concentration	2.01 µg/L, 3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	1.2% (n=7)
Between-run Standard Deviation	2.4%
Accuracy (% of expected)	99.1%

tetrachloroethene

recovery from fortified blank

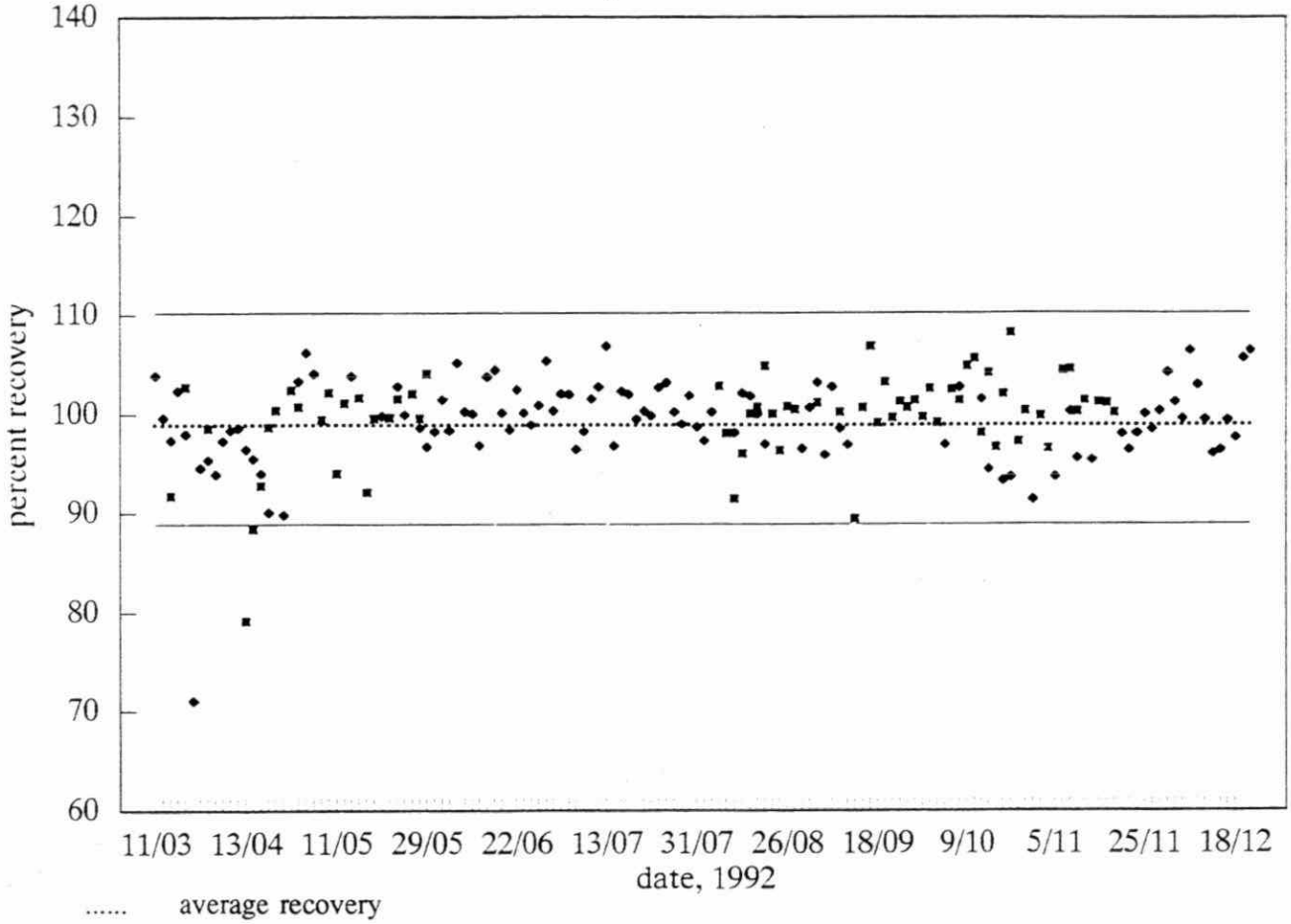


Performance Summary Table January - December 1992

Analyte	tetrachloroethene
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	1.1% (n=7)
Between-run Standard Deviation	2.4%
Accuracy (% of expected)	99.1%

dibromochloromethane

recovery from fortified blank

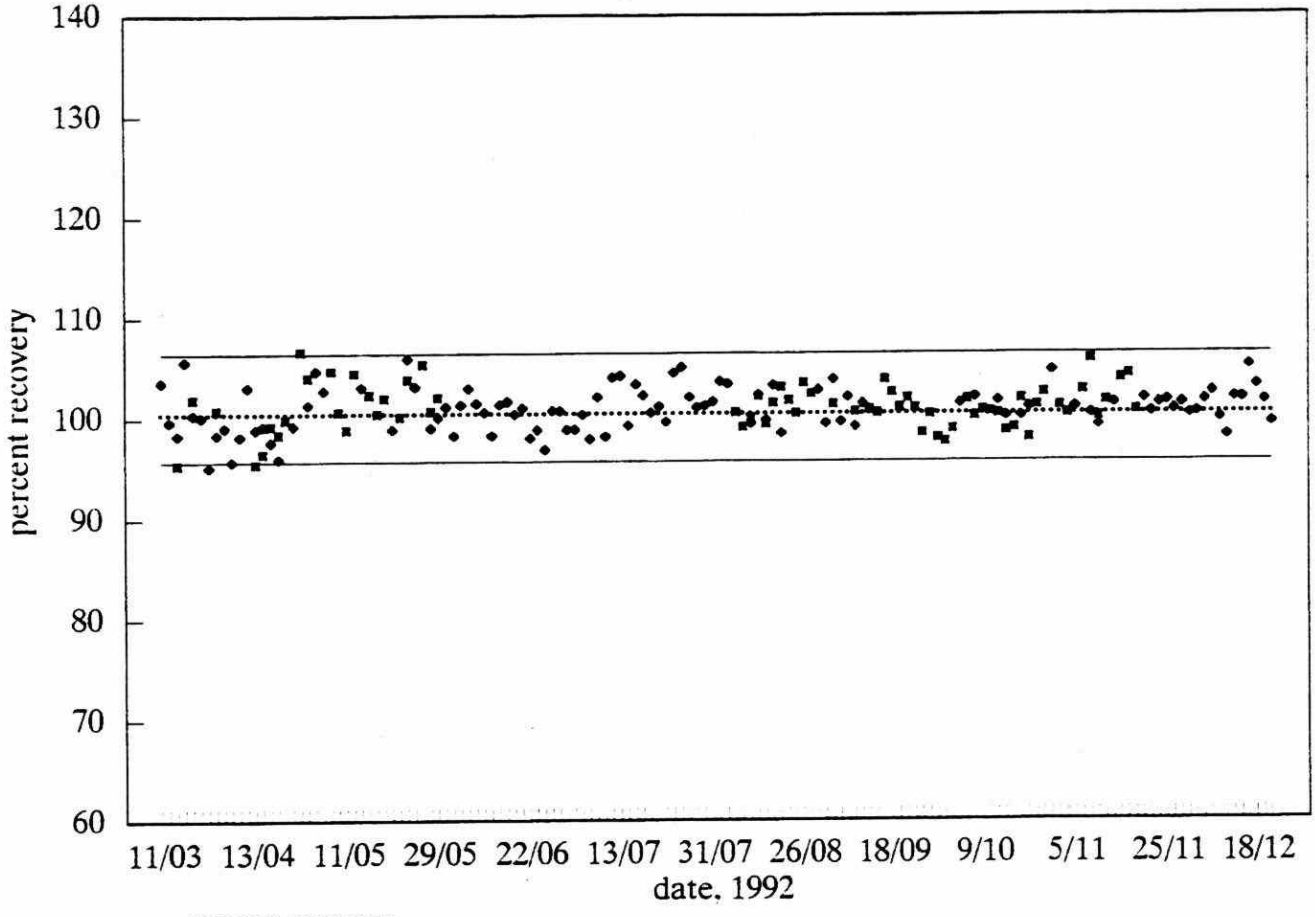


Performance Summary Table January - December 1992

Analyte	dibromochloromethane
True Concentration	6.44 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	2.5% (n=7)
Between-run Standard Deviation	4.2%
Accuracy (% of expected)	99.6%

1,2-dibromoethane

recovery from fortified blank

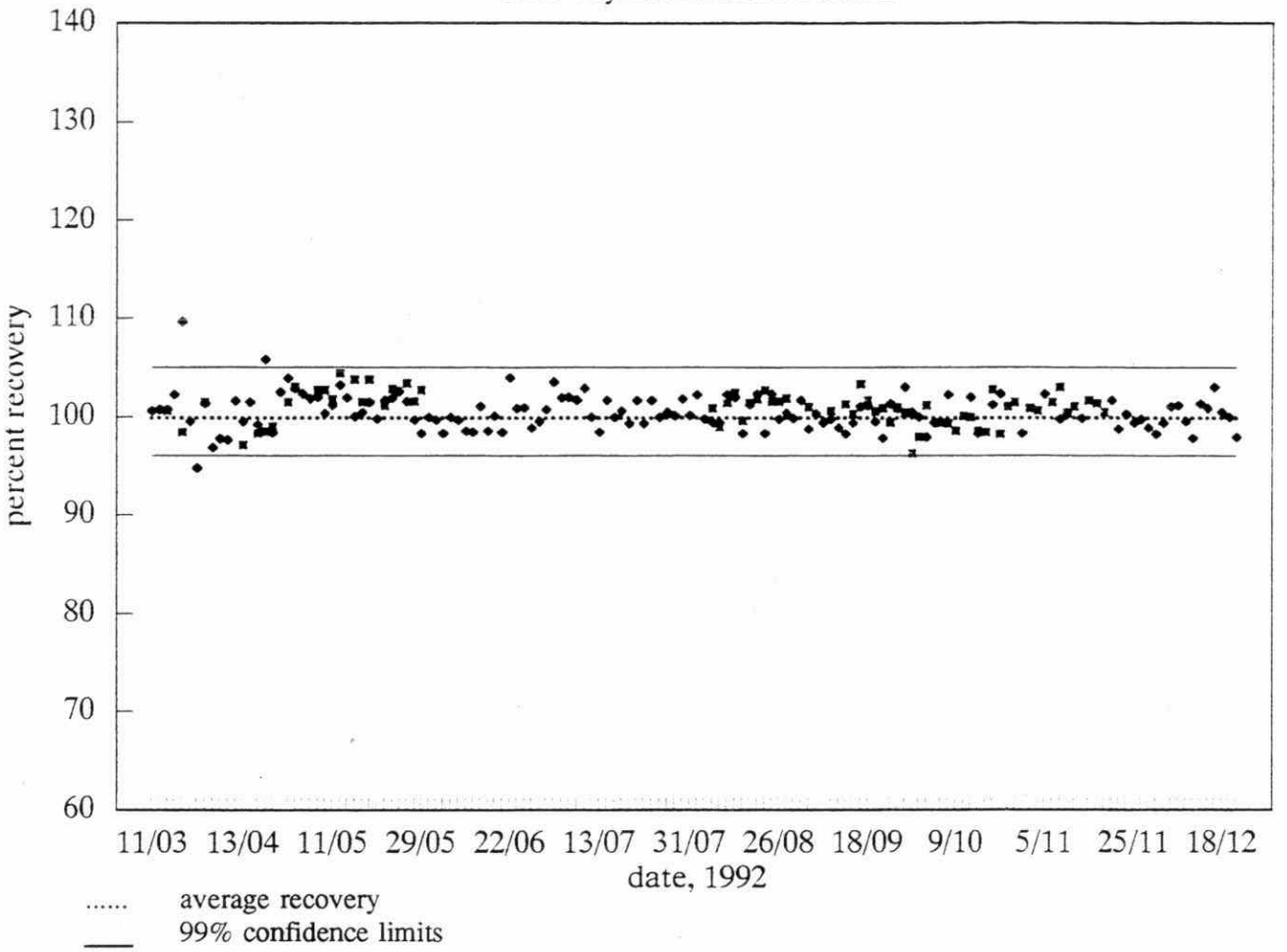


Performance Summary Table January - December 1992

Analyte	1,2-dibromoethane
True Concentration	5.52 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	2.0% (n=7)
Between-run Standard Deviation	2.1%
Accuracy (% of expected)	101.1%

chlorobenzene

recovery from fortified blank

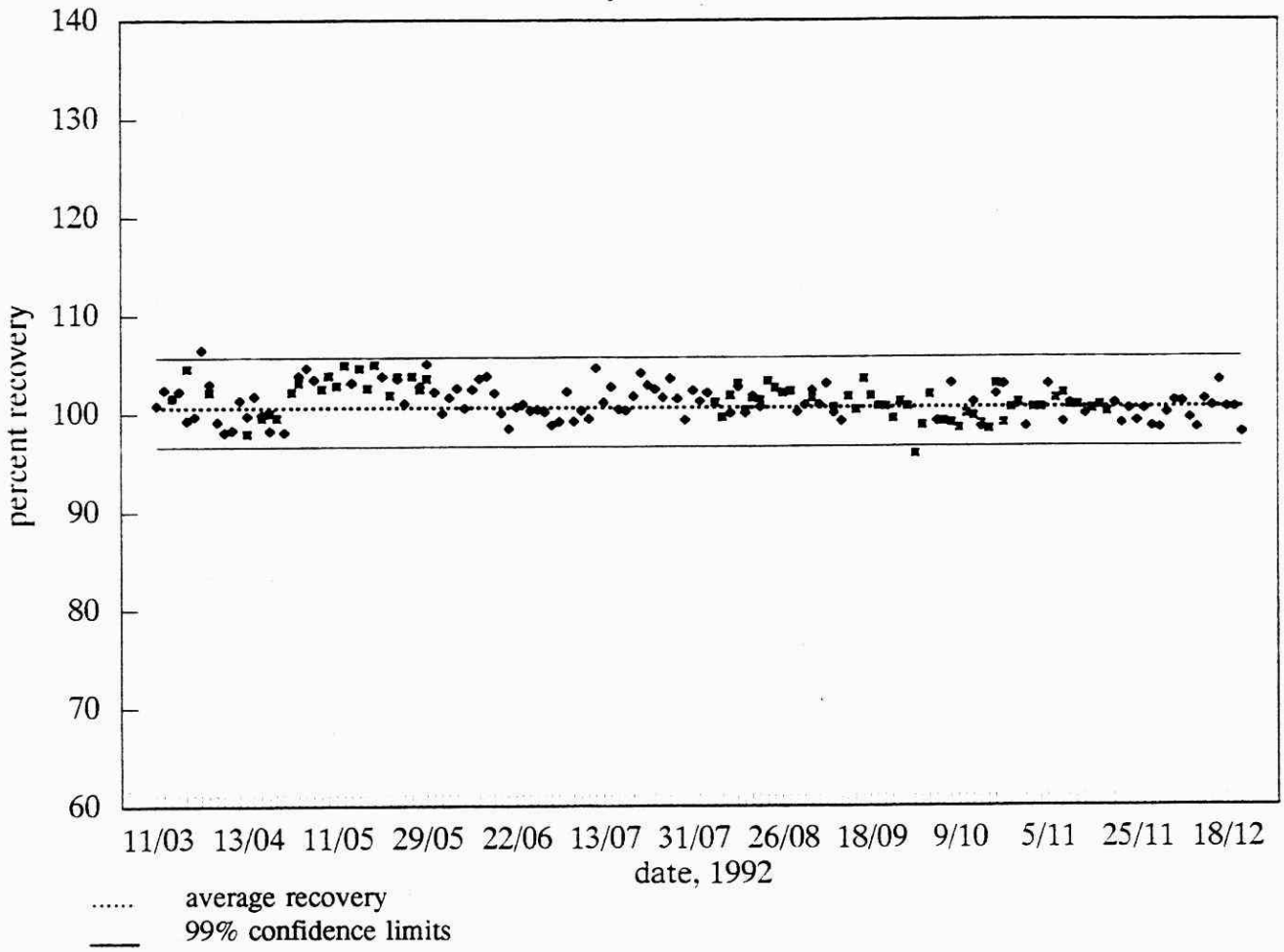


Performance Summary Table January - December 1992

Analyte	chlorobenzene
True Concentration	4.6 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	0.9% (n=7)
Between-run Standard Deviation	1.8%
Accuracy (% of expected)	100.5%

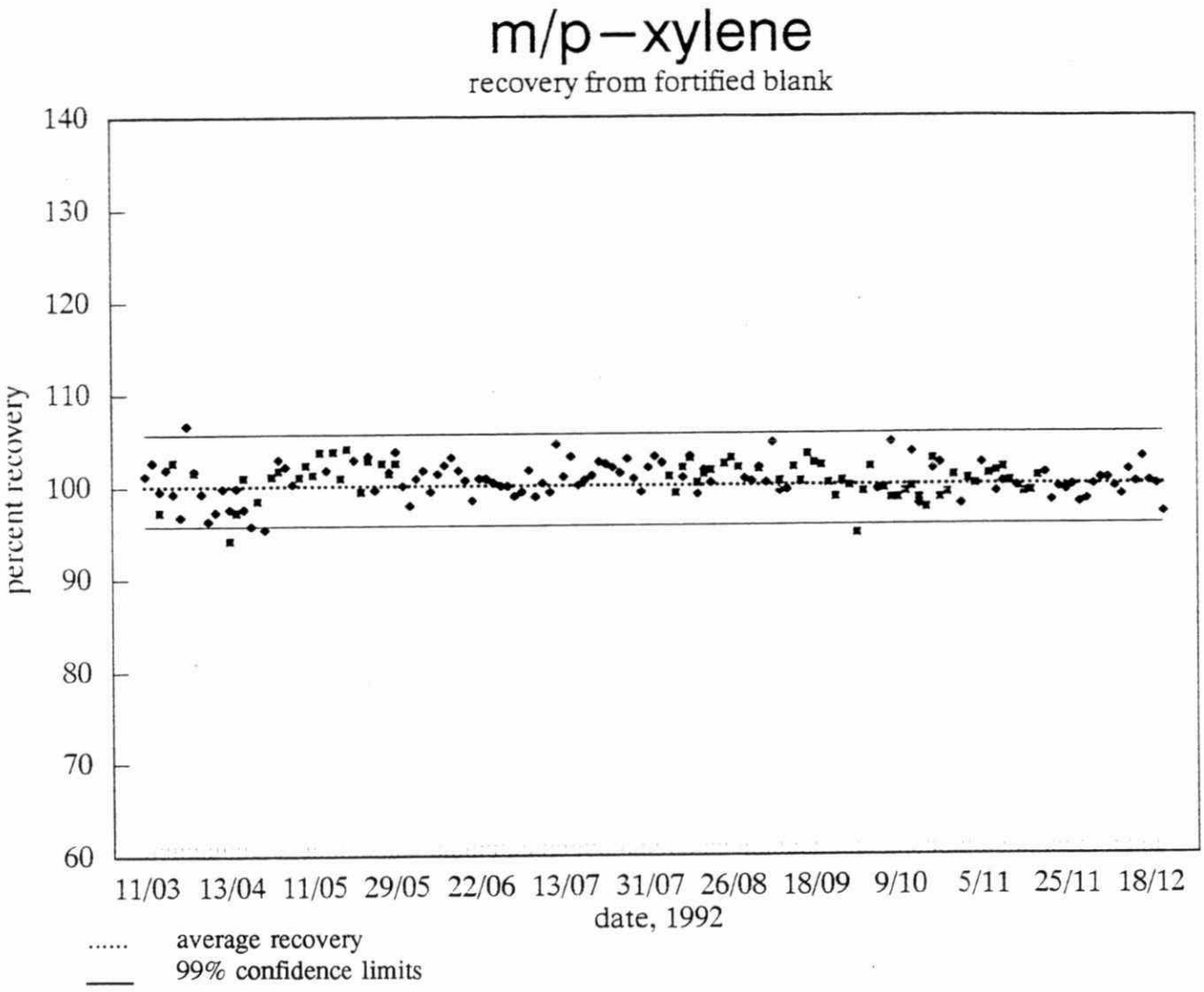
ethylbenzene

recovery from fortified blank



Performance Summary Table January - December 1992

Analyte	ethylbenzene
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	0.9% (n=7)
Between-run Standard Deviation	1.8%
Accuracy (% of expected)	101.2%

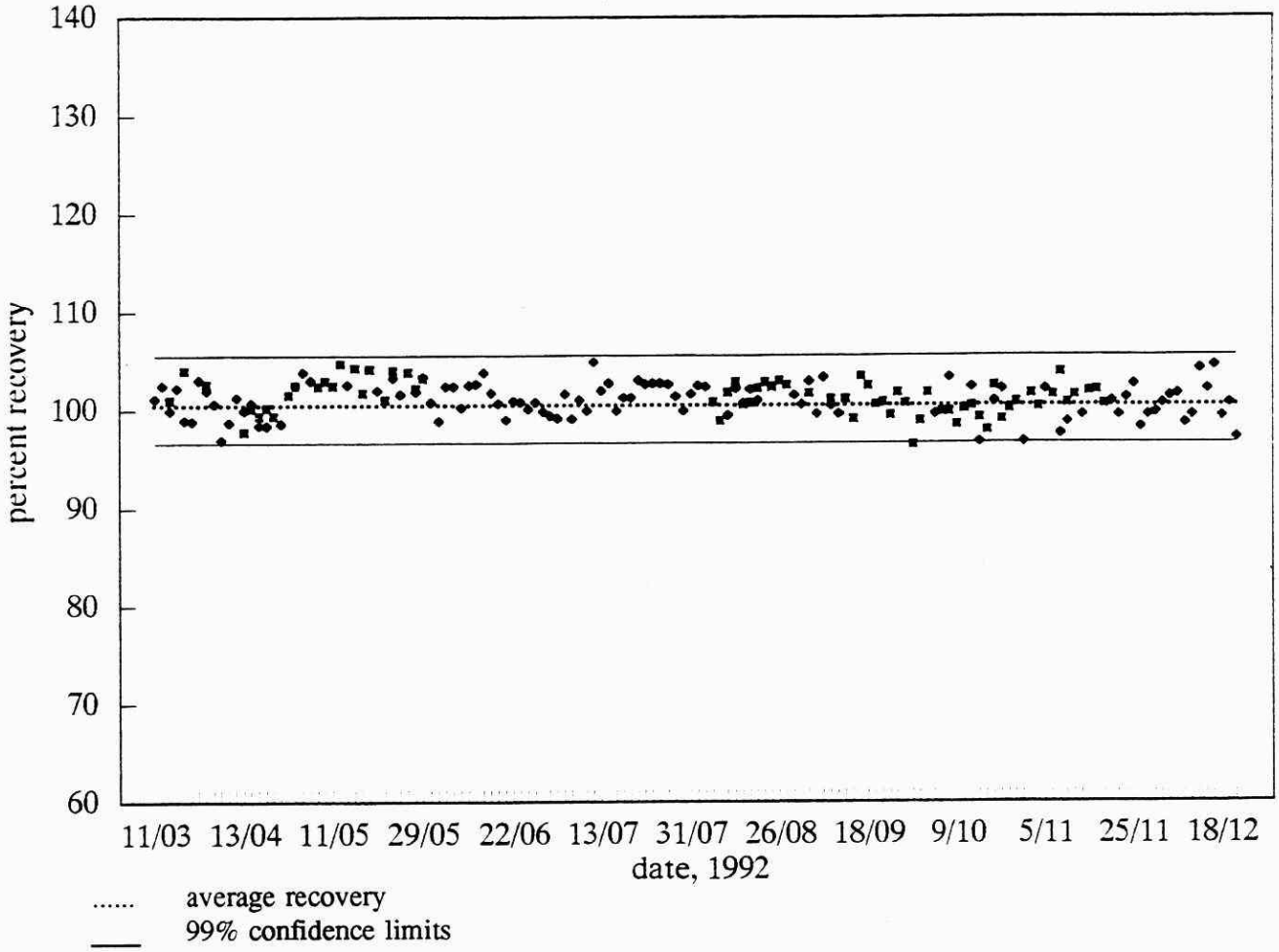


Performance Summary Table January - December 1992

Analyte	m/p-xylene
True Concentration	3.68 µg/L
Number of Observations	171
Within-run Rel. Standard Deviation	0.8% (n=7)
Between-run Standard Deviation	1.9%
Accuracy (% of expected)	100.7%

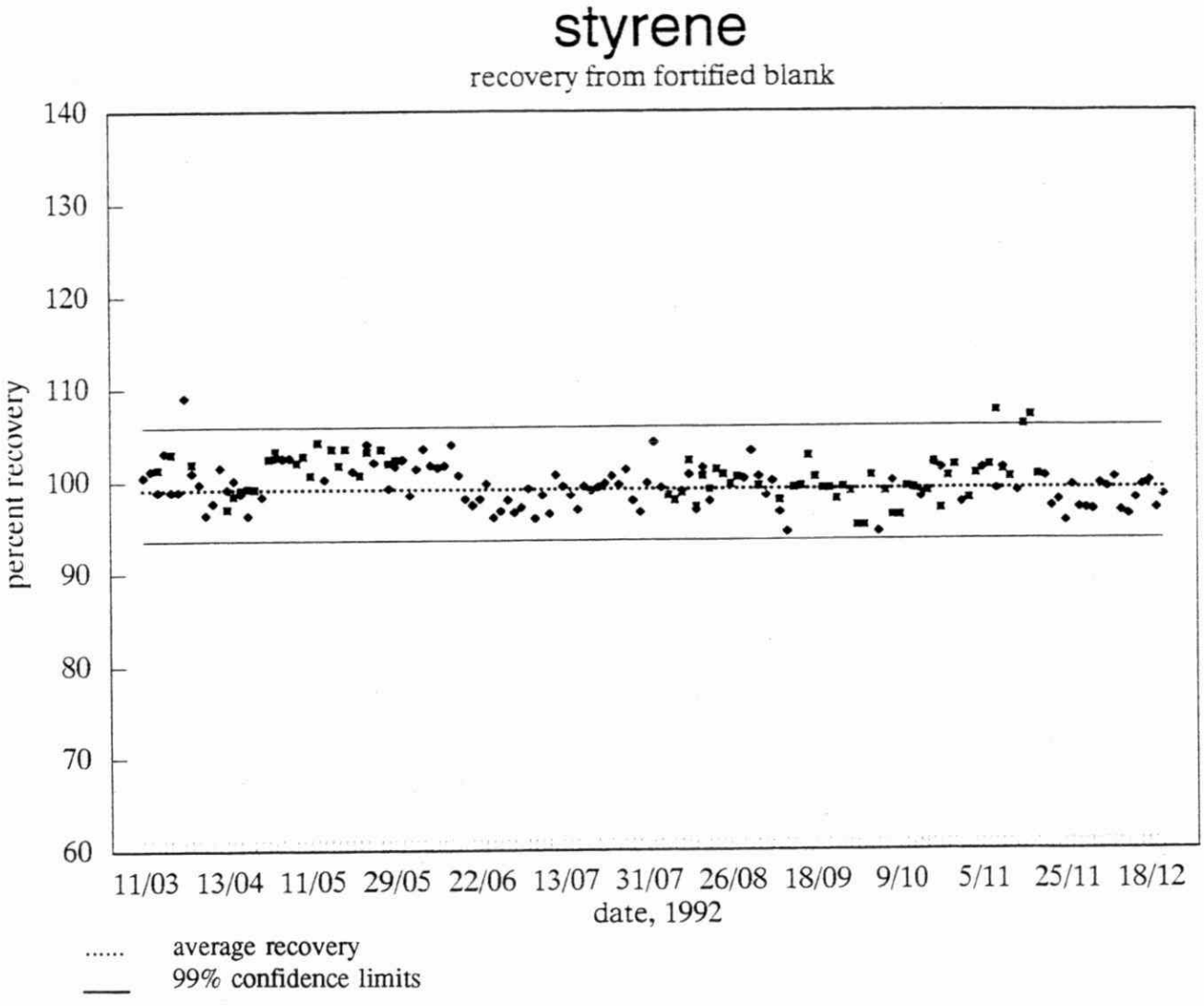
o–xylene

recovery from fortified blank



Performance Summary Table January - December 1992

Analyte	o-xylene
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	1.3% (n=7)
Between-run Standard Deviation	1.8%
Accuracy (% of expected)	101.1%

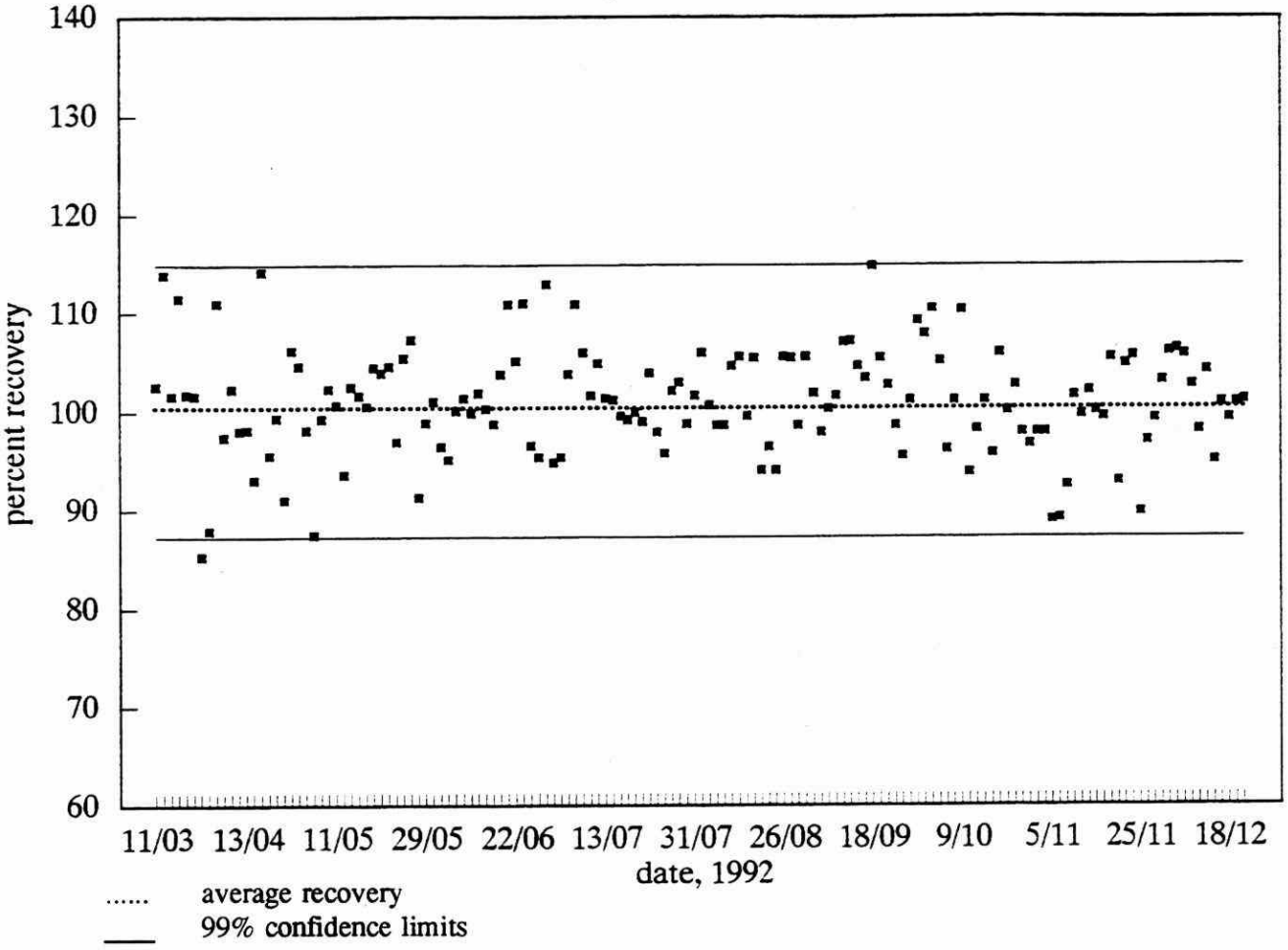


Performance Summary Table Janary - December 1992

Analyte	styrene
True Concentration	3.68 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	1.2% (n=7)
Between-run Standard Deviation	2.4%
Accuracy (% of expected)	99.7%

bromoform

recovery from fortified blank

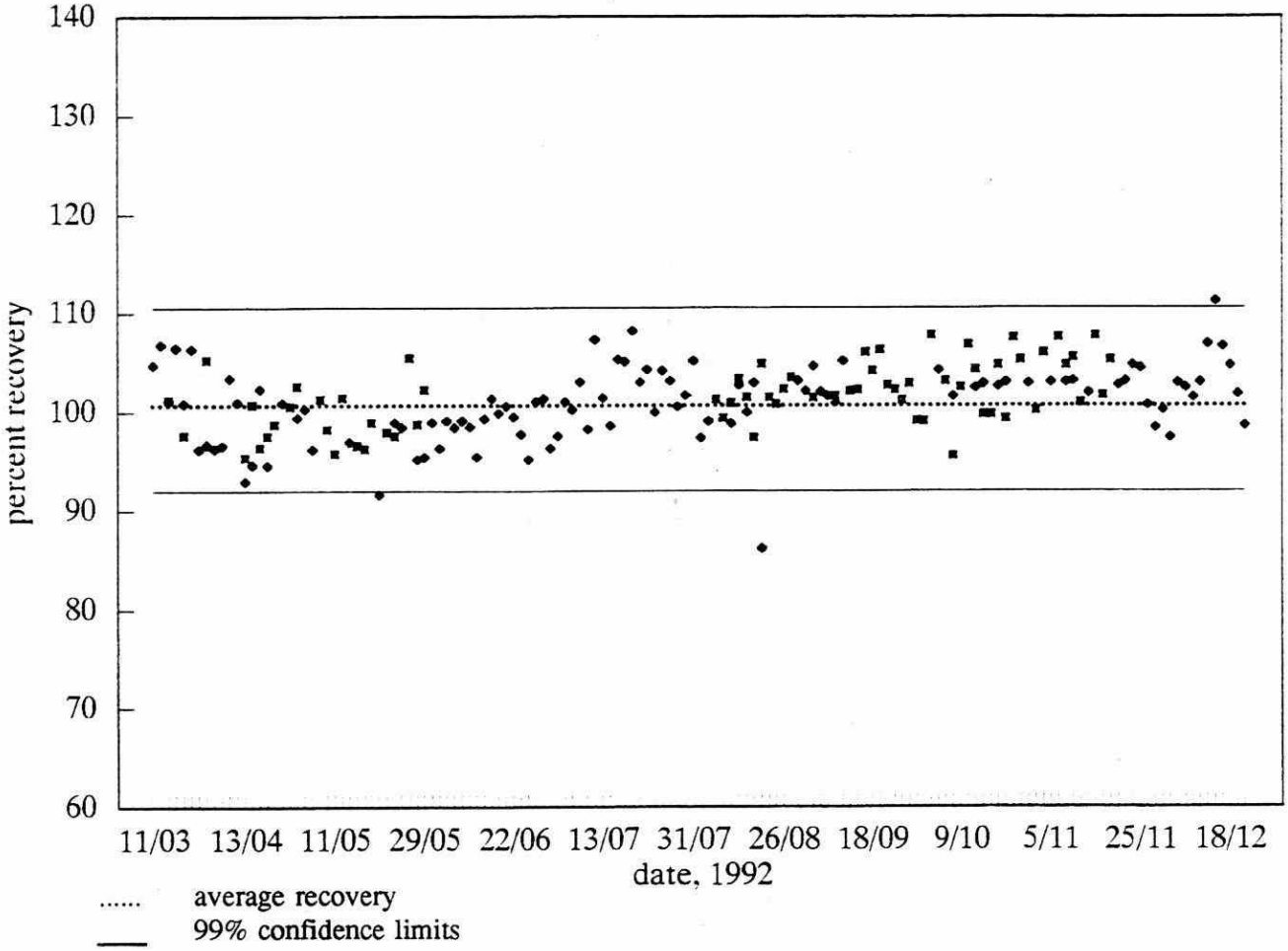


Performance Summary Table January - December 1992

Analyte	bromoform
True Concentration	7.36 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	4.4% (n=7)
Between-run Standard Deviation	6%
Accuracy (% of expected)	100%

1,1,2,2–tetrachloroethane

recovery from fortified blank

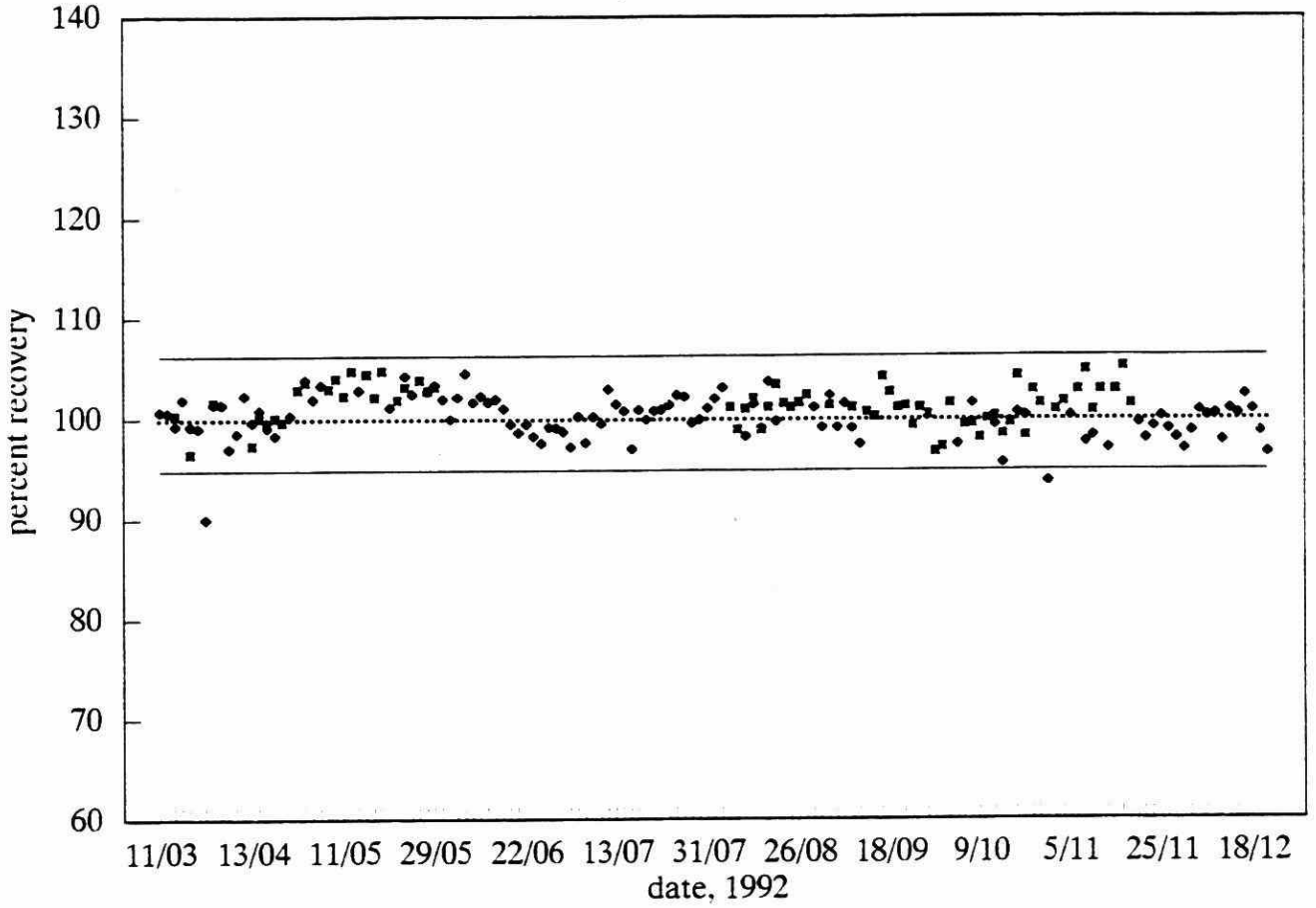


Performance Summary Table January - December 1992

Analyte	1,1,2,2-tetrachloroethane
True Concentration	5.52 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	1.7% (n=7)
Between-run Standard Deviation	3.7%
Accuracy (% of expected)	101.3%

1,3–dichlorobenzene

recovery from fortified blank



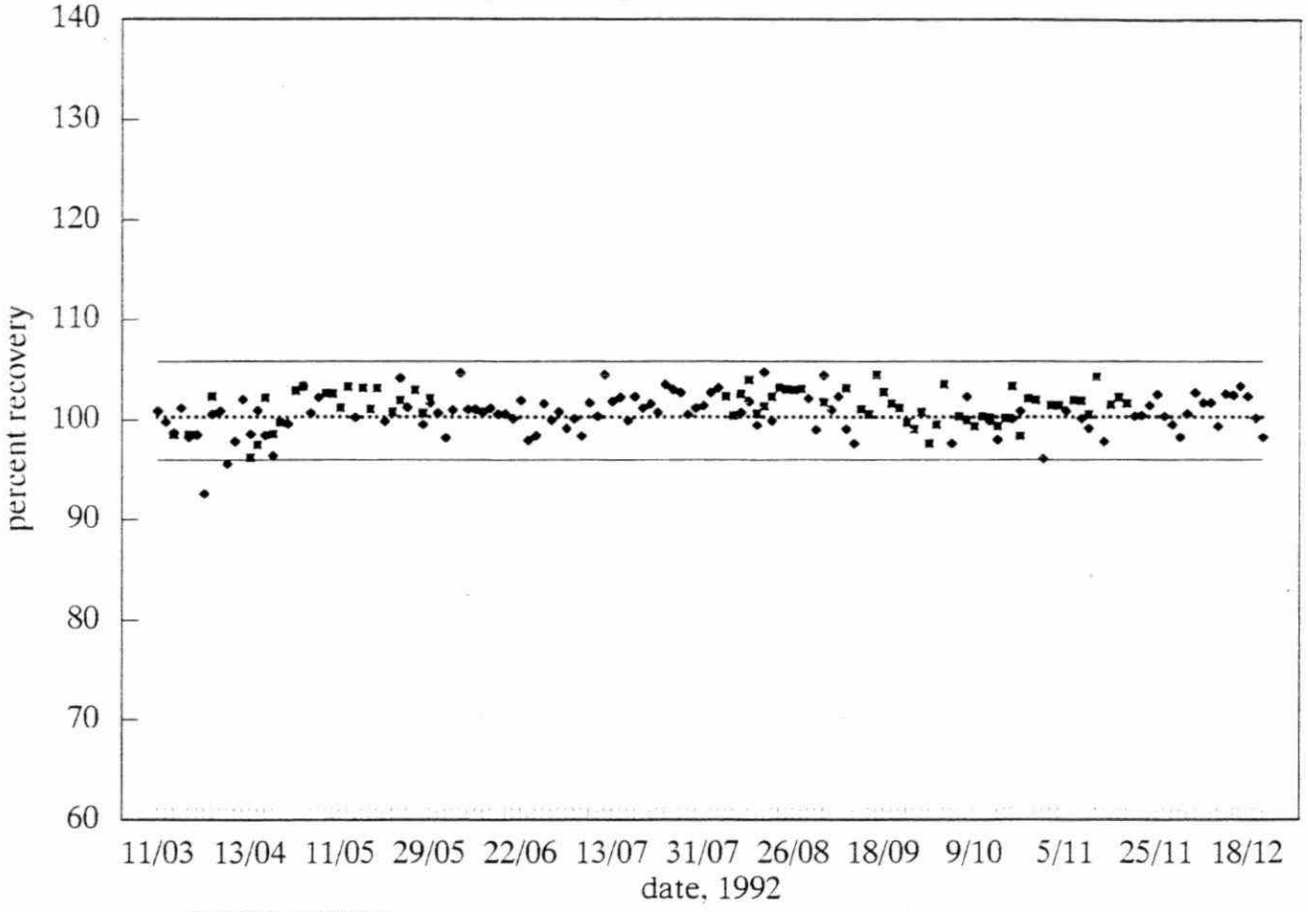
..... average recovery
___ 99% confidence limits

Performance Summary Table January - December 1992

Analyte	1,3-dichlorobenzene
True Concentration	5.52 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	0.8% (n=7)
Between-run Standard Deviation	2.2%
Accuracy (% of expected)	100.5%

1,4–dichlorobenzene

recovery from fortified blank

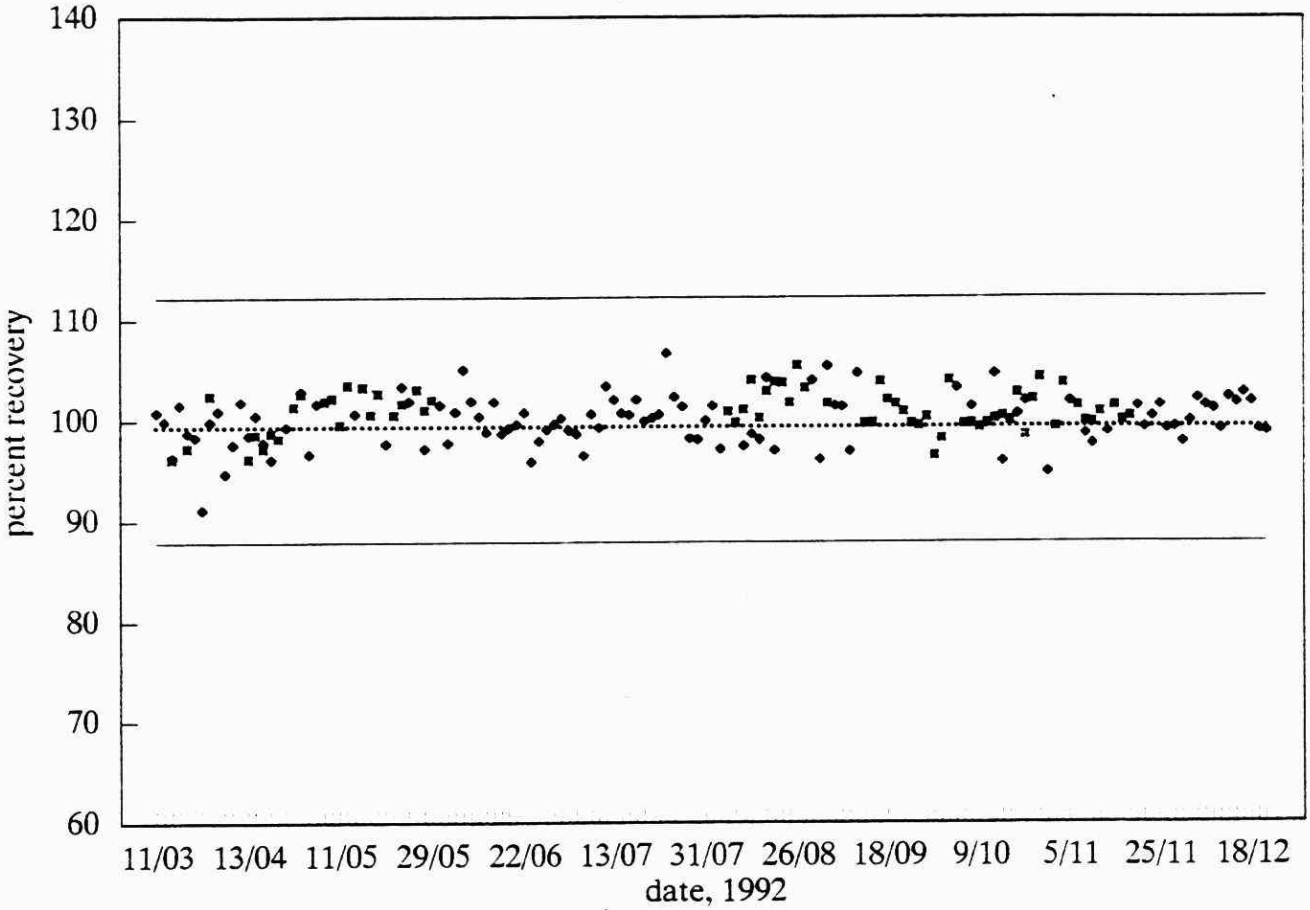


Performance Summary Table January - December 1992

Analyte	1,4-dichlorobenzene
True Concentration	5.52 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	0.5% (n=7)
Between-run Standard Deviation	1.9%
Accuracy (% of expected)	100.9%

1,2–dichlorobenzene

recovery from fortified blank



..... average recovery
___ 99% confidence limits

Performance Summary Table January - December 1992

Analyte	1,2-dichlorobenzene
True Concentration	5.52 µg/L
Number of Observations	172
Within-run Rel. Standard Deviation	0.8% (n=7)
Between-run Standard Deviation	4.8%
Accuracy (% of expected)	100.0%

METHOD CODE : OPTM-E3237A
METHOD TITLE: The Determination of Trihalomethanes in Water by Purge-and-Trap/Gas Chromatography

LABORATORY : Priority Pollutants Unit
SUPERVISOR : Dr. W. Berg

SAMPLE TYPE : raw and treated drinking water

PRINCIPLE OF THE METHOD :

Trihalomethanes are purged from an aqueous sample onto an adsorbtion trap, and subsequently, thermally desorbed onto a gas chromatographic capillary column. After separation, the organics are identified and quantified by Hall electrolytic conductivity detector.

PARAMETERS MEASURED :	LIS TEST CODE	W (µg/L)	T (µg/L)
Chloroform	X1005J	0.5	5.0
Bromodichloromethane	X1010J	0.2	2.0
Dibromochloromethane	X1011J	0.2	2.0
Bromoform	X1015J	0.2	2.0
Total THM's	X2TTHM	0.5	5.0

REPORTING FORMAT :

Results are reported in parts per billion (µg/L) rounded off to the closest increment of W and up to maximum of three significant figures.

QUALITY CONTROL :

The routine quality control samples are designed to verify absence of potential contamination (method blanks) and to monitor validity of calibration (calibration solutions) and the agreement with the established method precision and accuracy (laboratory replicate samples, blank fortified with a certified solution).

The results for the analysis of calibration solution and the analysis of reference material have their control limits statistically derived.

REMARKS : In addition to the intra-laboratory method control, the performance of the method was examined through performance audit samples program organized by LSB Quality Management Office.

List of Performance Charts :
Chloroform (recovery from fortified blank)
Bromodichloromethane (recovery from fortified blank)
Dibromochloromethane (recovery from fortified blank)
Bromoform (recovery from fortified blank)

List of Performance Tables :
Method Blanks Summary
Chloroform
Bromodichloromethane
Dibromochloromethane
Bromoform

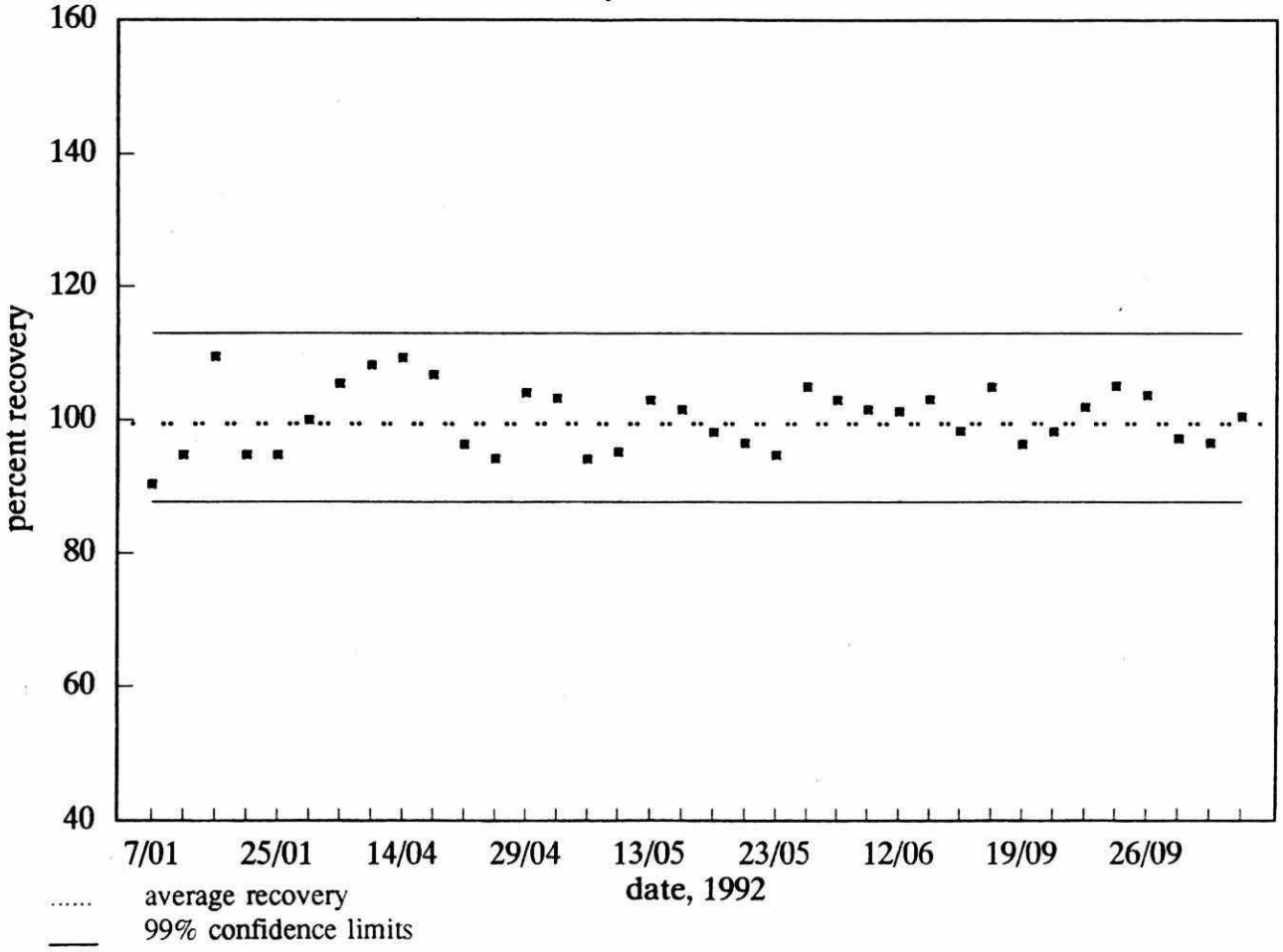
Method Blanks Summary January 1992 - December 1992

Analyte	Number of Observations	Average Concentration (µg/L)	Standard Deviation (µg/L)
chloroform	104	0.09	0.24
bromodichloromethane	104	0.02	0.07
dibromochloromethane	104	0.004	0.027
bromoform	104	ND (0.3)	
THM's - total	104	0.12	0.30

ND ... Not detected. Detection limit in µg/L given in brackets ( ).

chloroform

recovery from fortified blank

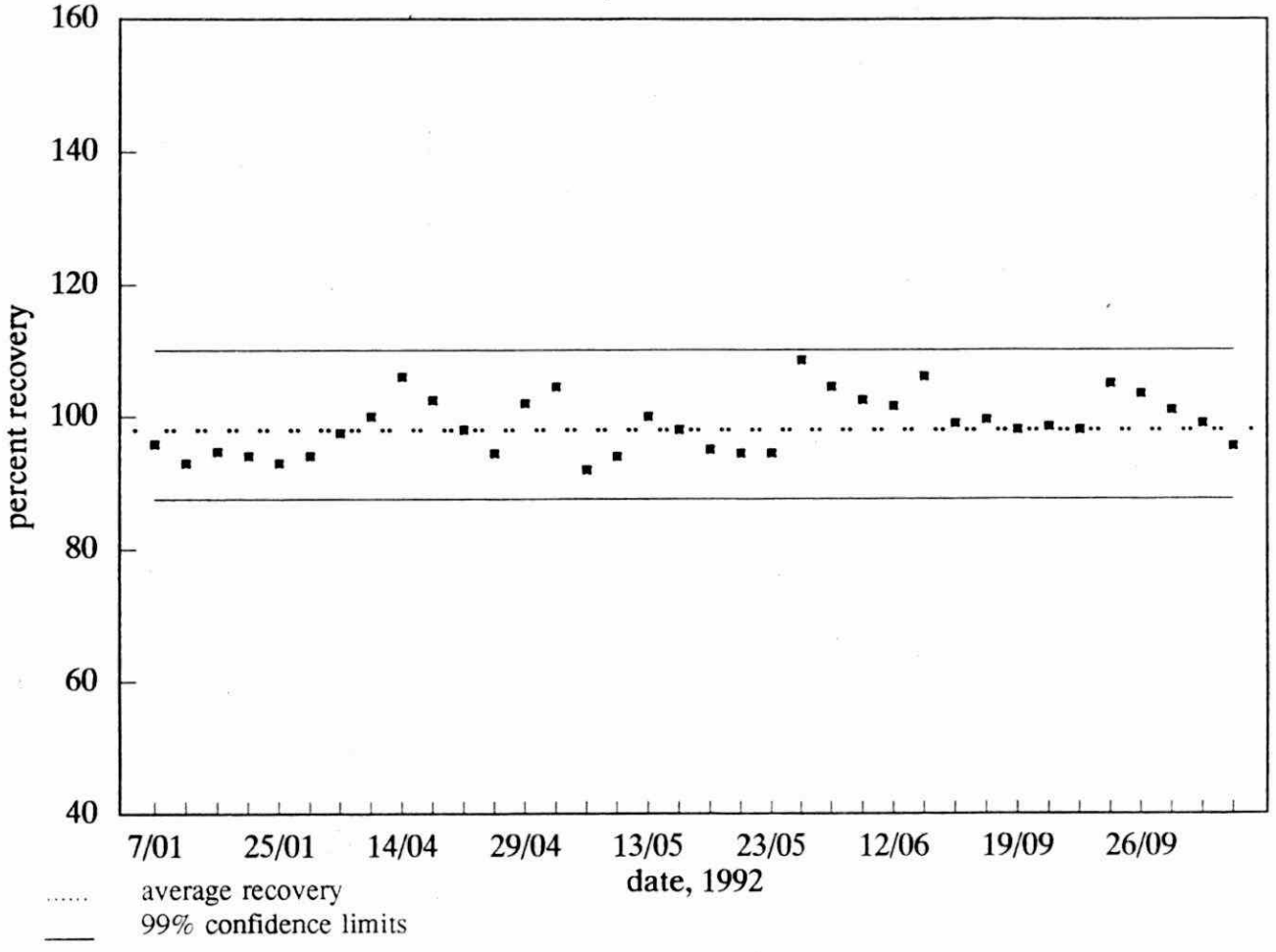


Performance Summary Table January - December 1992

Analyte	chloroform
True Concentration	100 µg/L
Number of Observations	36
Within-run Rel. Standard Deviation	2.4% (n=13)
Between-run Standard Deviation	4.9%
Accuracy (% of expected)	100.3%

bromodichloromethane

recovery from fortified blank

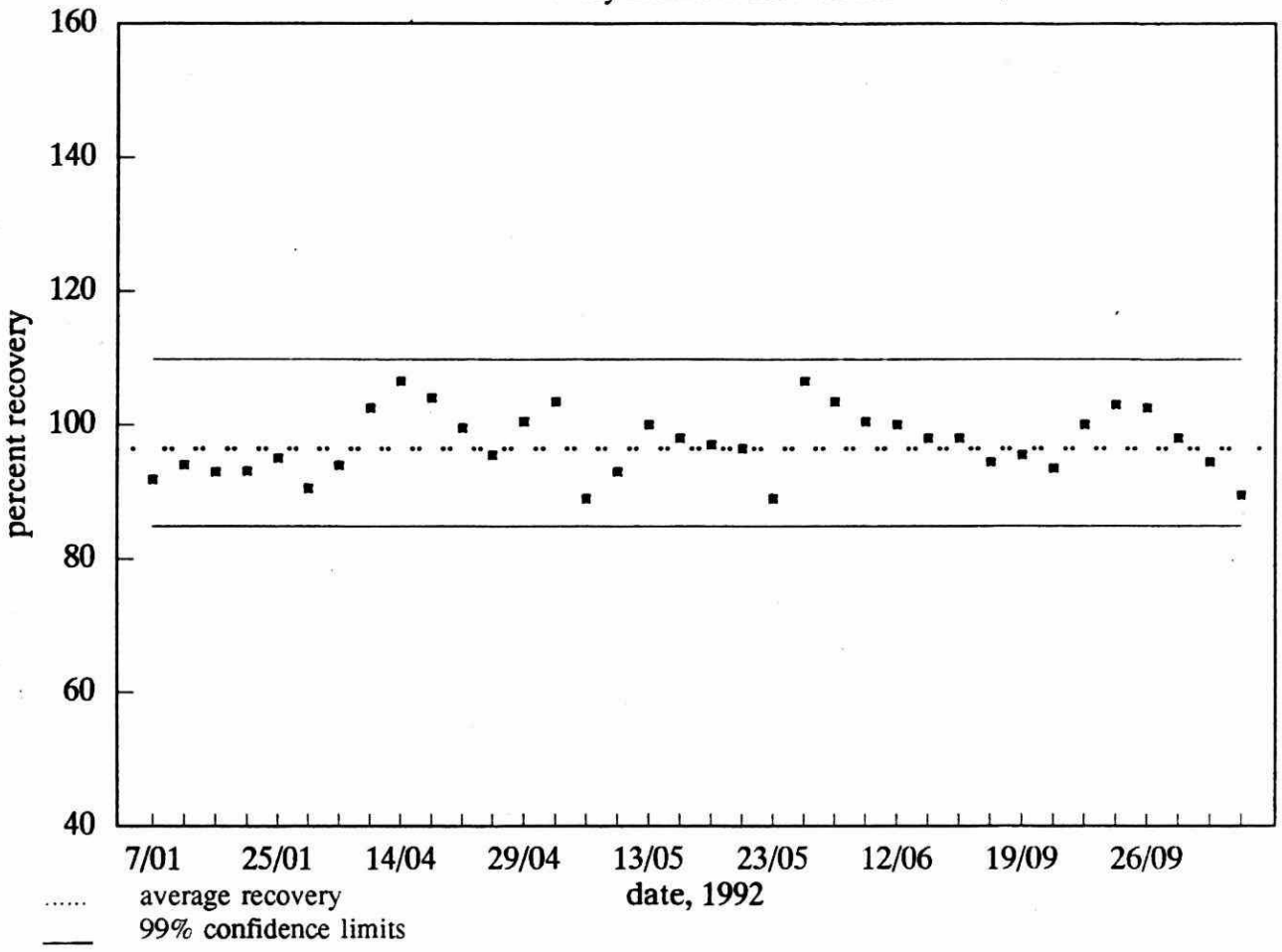


Performance Summary Table January - December 1992

Analyte	bromodichloromethane
True Concentration	20 µg/L
Number of Observations	36
Within-run Rel. Standard Deviation	1.9% (n=13)
Between-run Standard Deviation	4.4%
Accuracy (% of expected)	98.8%

dibromochloromethane

recovery from fortified blank

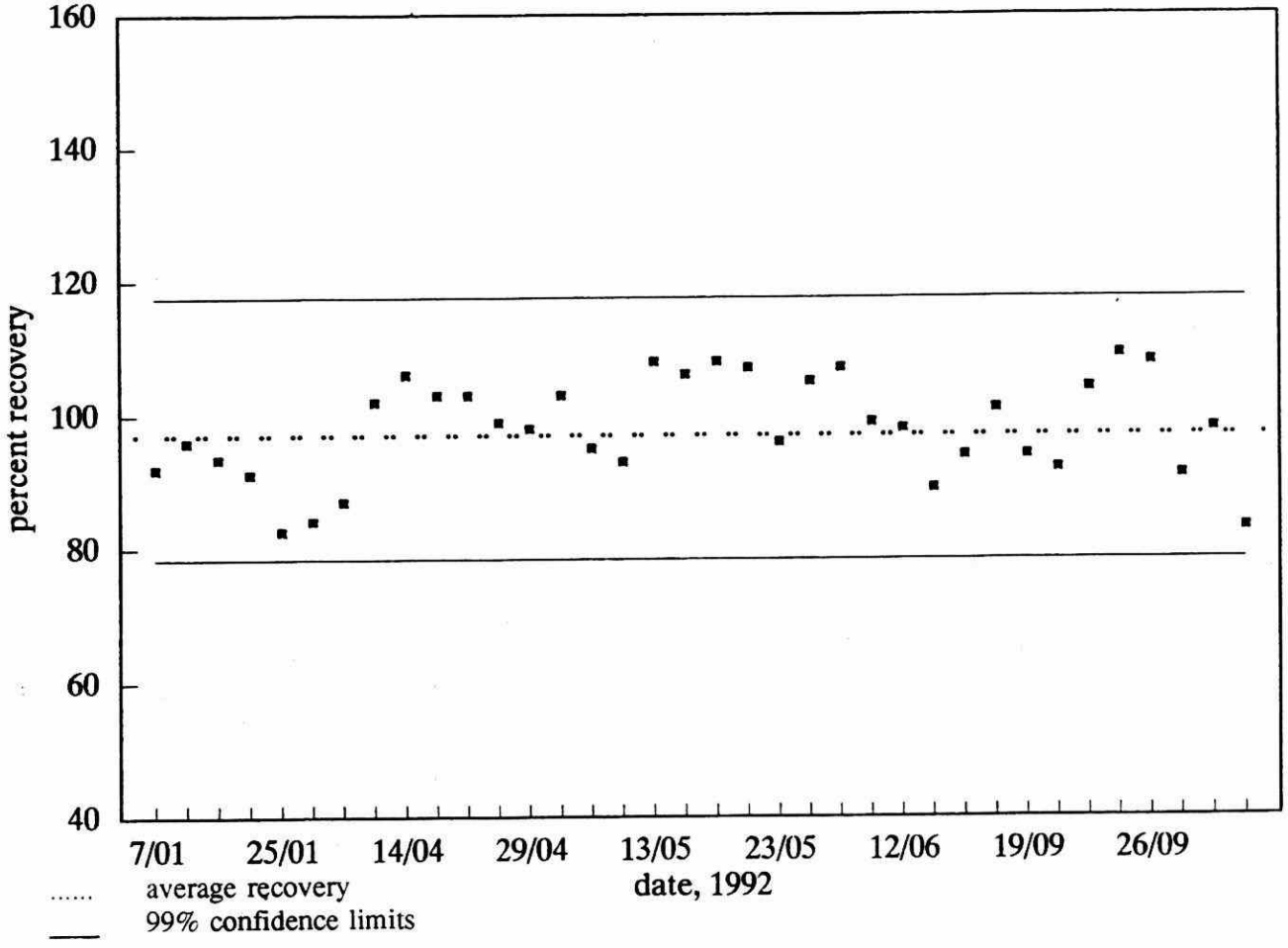


Performance Summary Table January - December 1992

Analyte	dibromochloromethane
True Concentration	20 µg/L
Number of Observations	36
Within-run Rel. Standard Deviation	3.8% (n=13)
Between-run Standard Deviation	4.8%
Accuracy (% of expected)	97.3%

bromoform

recovery from fortified blank



Performance Summary Table January - December 1992

Analyte	bromoform
True Concentration	10 µg/L
Number of Observations	36
Within-run Rel. Standard Deviation	5% (n=13)
Between-run Standard Deviation	8%
Accuracy (% of expected)	98%

METHOD CODE : OWOC-E3120B
METHOD TITLE: The Determination of Organochlorine Pesticides, Polychlorinated Biphenyls and Other Chlorinated Organic Compounds in Water by GC-ECD

LABORATORY : Organic Water Unit
SUPERVISOR : P. Crozier/ Dr. D. Hall

SAMPLE TYPE : surface water, groundwater, raw and treated drinking water

PRINCIPLE OF THE METHOD :

Samples are extracted with an organic solvent; the extract is dried, concentrated by rotary evaporator, cleaned-up on Florisil, and re-concentrated prior to analysis by dual column capillary gas chromatography with dual electron capture detection.

PARAMETERS MEASURED :	LIS TEST CODE	W (ng/L)	T (ng/L)
hexachloroethane	X2HCE	1	10
1,3,5-trichlorobenzene	X2135	5	50
1,2,4-trichlorobenzene	X2124	5	50
1,2,3-trichlorobenzene	X2123	5	50
hexachlorobutadiene	X1HCBD	1	10
2,4,5-trichlorotoluene	X2T245	5	50
2,3,6-trichlorotoluene	X2T236	5	50
1,2,3,5-tetrachlorobenzene	X21235	1	10
1,2,4,5-tetrachlorobenzene	X21245	1	10
1,2,3,4-tetrachlorobenzene	X21234	1	10
α,2,6-trichlorotoluene	X2T26A	5	50
pentachlorobenzene	X2PNCB	1	10
hexachlorobenzene	X2HCB	1	10
heptachlor	P1HEPT	1	10
aldrin	P1ALDR	1	10
p,p'-DDE	P1PPDE	1	10
α-BHC	P1BHCA	1	10
ß-BHC	P1BHCB	1	10
γ-BHC	P1BHCG	1	10
α-chlordane	P1CHLA	2	20
γ-chlordane	P1CHLG	2	20
oxychlordane	P1OCHL	2	20
o,p'-DDT	P1OPDT	5	50
p,p'-DDD	P1PPDD	5	50
p,p'-DDT	P1PPDT	5	50
methoxychlor	P1DMDT	5	50

(parameters measured continued)

heptachlor epoxide	P1HEPE	1	10
endosulfan I	P1END1	2	20
dieldrin	P1DIEL	2	20
endrin	P1ENDR	5	50
endosulfan II	P1END2	5	50
endosulfan cyclic sulfate	P1ENDS	5	50
mirex	P1MIRX	5	50
total PCB's	P1PCBT	20	200
octachlorostyrene	X2OCST	1	10
toxaphene	P1TOX	500	5 000

REPORTING FORMAT :

Results are reported in parts per trillion (ng/L) rounded off to the closest increment of W and up to maximum of two significant figures.

QUALITY CONTROL :

The routine quality control operations monitor validity of calibration (calibration check solution), required instrument sensitivity (low level check solution), absence of potential interferences (method blanks) and overall method performance (fortified method blanks).

For selected target compounds, control charts summarizing the response factors used to calibrate instruments and the recoveries from fortified method blanks are maintained.

REMARKS : In addition to the intra-laboratory method control, the performance of the method was examined through performance audit samples program organized by LSB Quality Management Office.

In 1992 the method participated in the Smithville Tender Intercomparison Study organized by the Laboratory Services Branch.

List of Performance Charts :
Hexachlorobenzene (recovery from fortified blank)
1,3,5-Trichlorobenzene (recovery from fortified blank)
Hexachlorobutadiene (recovery from fortified blank)
Mirex (recovery from fortified blank)
Total PCB (recovery from fortified blank)

List of Performance Tables :
Method Blanks Summary
Hexachlorobenzene
1,3,5-Trichlorobenzene
Hexachlorobutadiene
Mirex
Total PCB

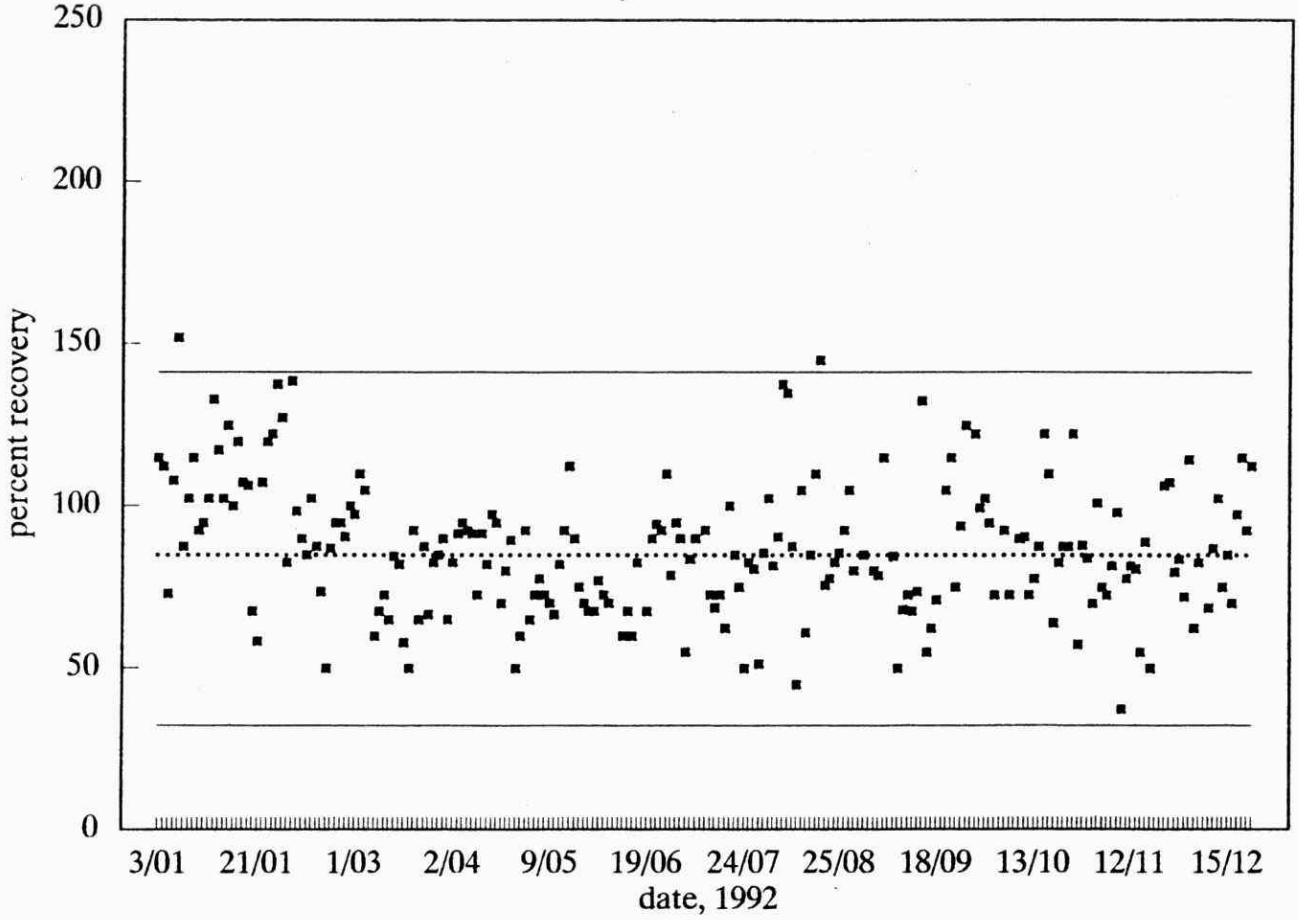
Method Blanks Summary January 1992 - December 1992

Analyte	Number of Observations	Average Concentration (ng/L)	Standard Deviation (ng/L)
hexachloroethane	126	ND (0.1)	
1,3,5-trichlorobenzene	126	ND (2)	
1,2,4-trichlorobenzene	126	0.4	4.6
1,2,3-trichlorobenzene	126	ND (2)	
hexachlorobutadiene	126	0.1	1.3
2,4,5-trichlorotoluene	126	ND (3)	
2,3,6-trichlorotoluene	126	ND (3)	
1,2,3,5-tetrachlorobenzene	126	ND (1)	
1,2,4,5-tetrachlorobenzene	126	ND (2)	
1,2,3,4-tetrachlorobenzene	126	ND (0.9)	
α,2,6-trichlorotoluene	126	ND (0.7)	
pentachlorobenzene	126	0.1	2.0
hexachlorobenzene	126	ND (0.5)	
heptachlor	126	ND (0.5)	
aldrin	126	ND (0.5)	
p,p'-DDE	126	ND (0.6)	
α-BHC	126	ND (0.5)	
ß-BHC	126	ND (1)	
γ-BHC	126	ND (0.4)	
α-chlordane	126	ND (0.6)	
γ-chlordane	126	ND (0.6)	
oxychlordane	126	ND (0.7)	
o,p'-DDT	126	ND (1)	
p,p'-DDD	126	ND (0.8)	
p,p'-DDT	126	ND (0.8)	
methoxychlor	126	ND (1)	
heptachlor epoxide	126	ND (0.5)	
endosulfan I	126	ND (0.5)	
dieldrin	126	ND (0.6)	
endosulfan II	126	ND (0.7)	
endosulfan cyclic sulfate	126	ND (0.7)	
mirex	126	0.03	0.21
total PCB's	126	0.9	4.7
octachlorostyrene	126	ND (0.5)	

ND ... Not detected. Detection limit in ng/L given in brackets ( ).

hexachlorobenzene

recovery from fortified blank



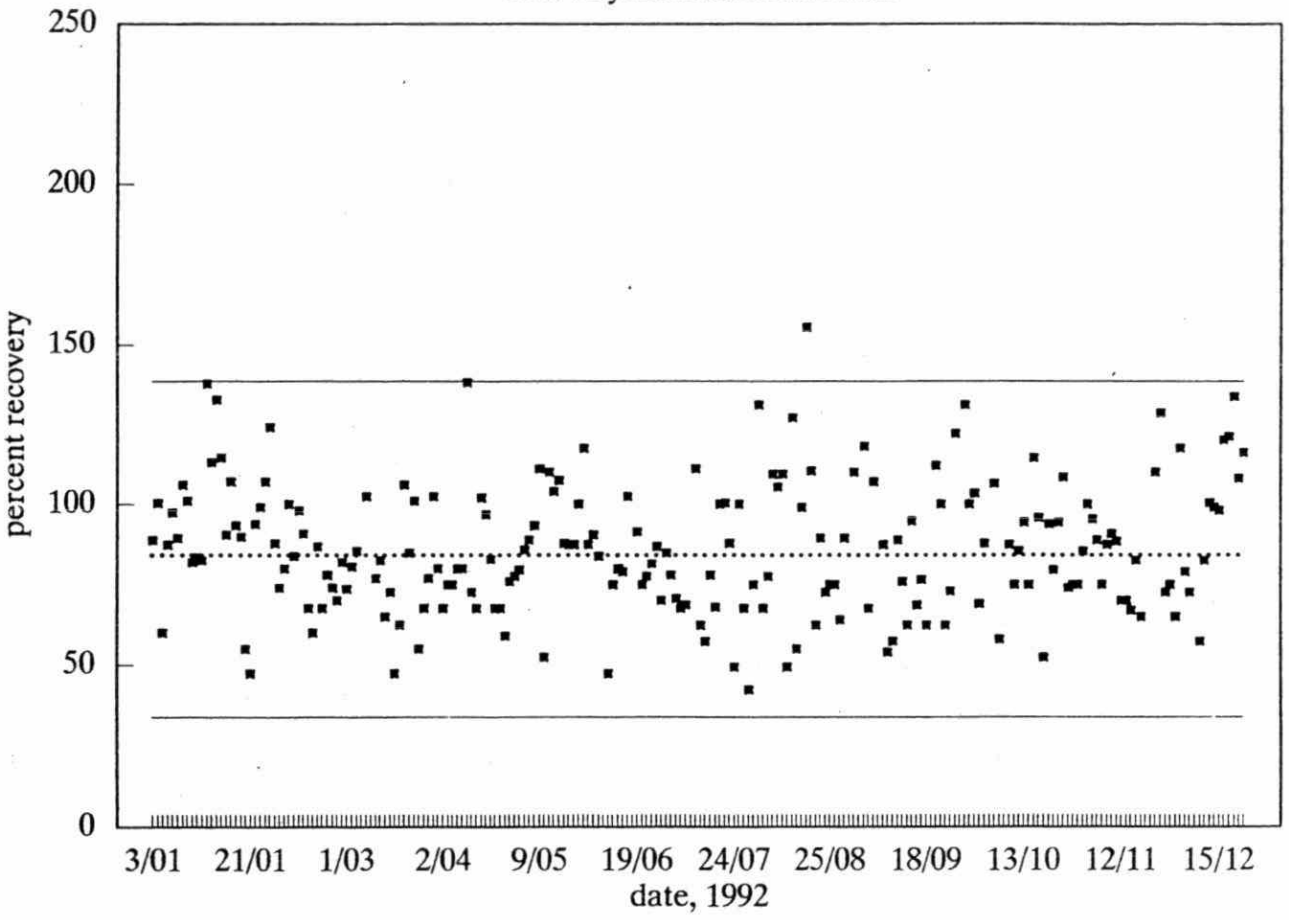
. . . . average recovery
____ 99% confidence limits

Method Performance Summary January - December 1992

Analyte	hexachlorobenzene
True Concentration	100 ng/L
Number of Observations	217
Between-run Standard Deviation	23%
Accuracy (% of expected)	85%

1,3,5–trichlorobenzene

recovery from fortified blank



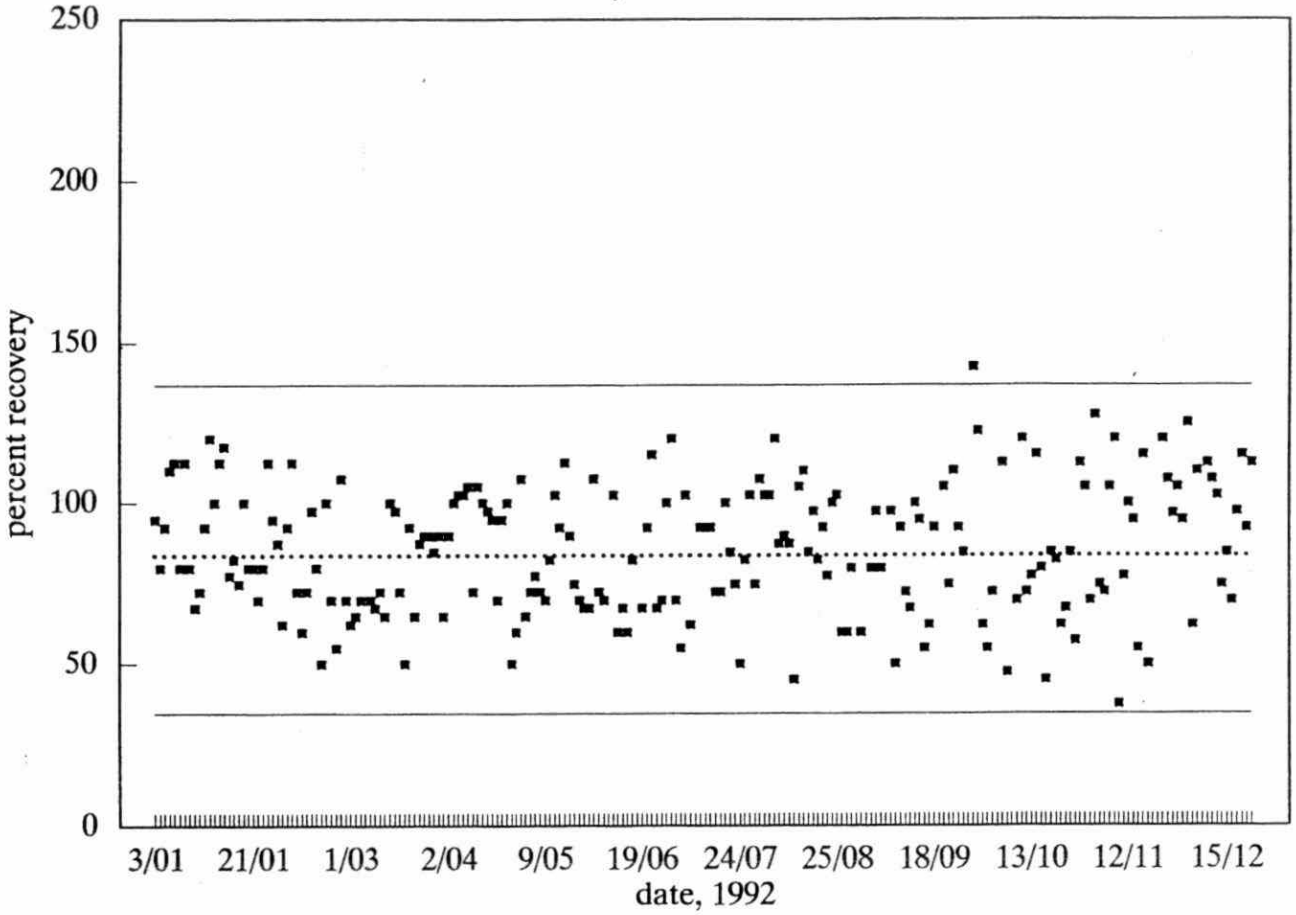
. . . . average recovery
____ 99% confidence limits

Method Performance Summary January - December 1992

Analyte	1,3,5-trichlorobenzene
True Concentration	100 ng/L
Number of Observations	212
Between-run Standard Deviation	21%
Accuracy (% of expected)	86%

hexachlorobutadiene

recovery from fortified blank



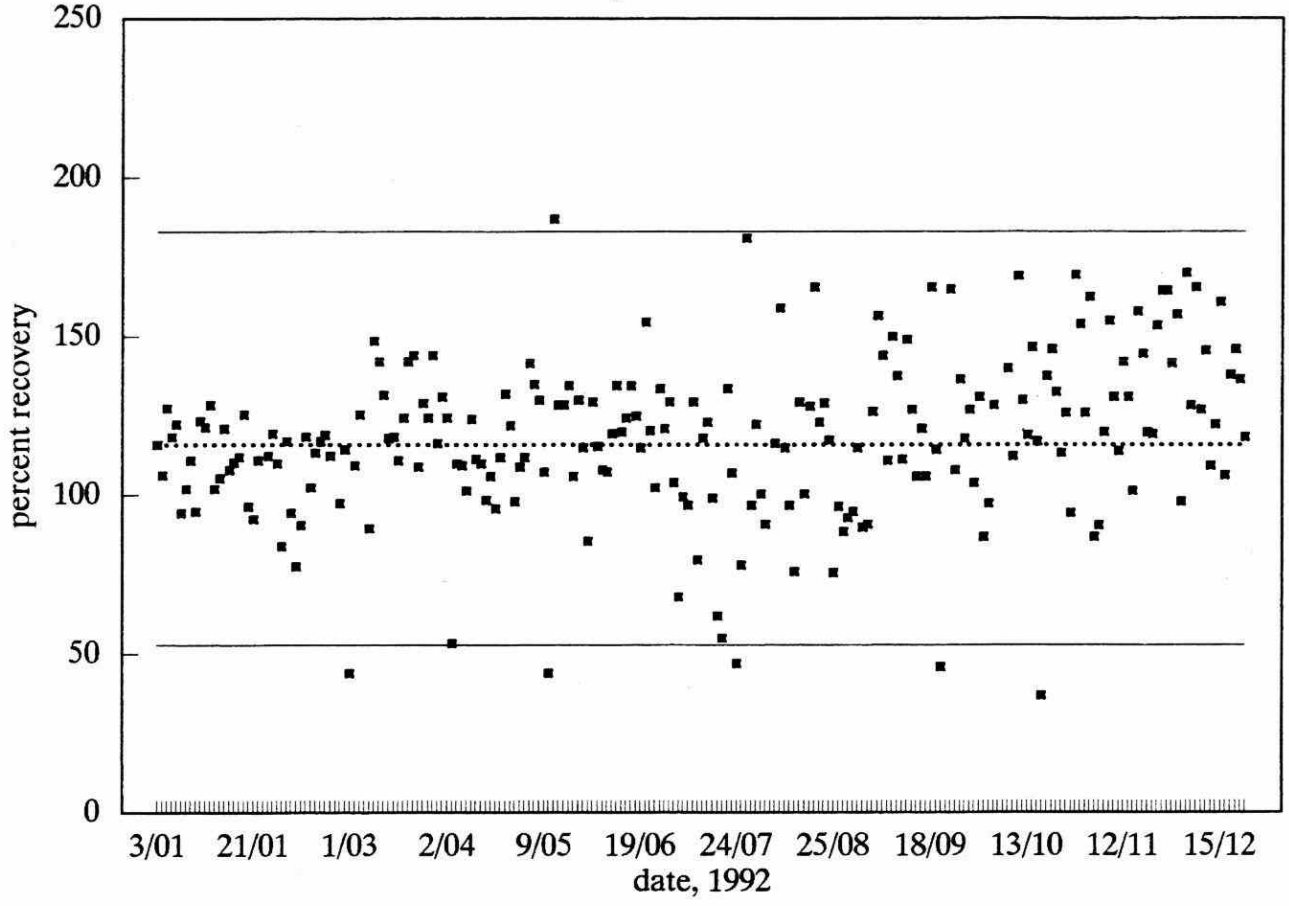
. . . . average recovery
____ 99% confidence limits

Method Performance Summary January - December 1992

Analyte	hexachlorobutadiene
True Concentration	20 ng/L
Number of Observations	216
Between-run Standard Deviation	21%
Accuracy (% of expected)	85%

mirex

recovery from fortified blank



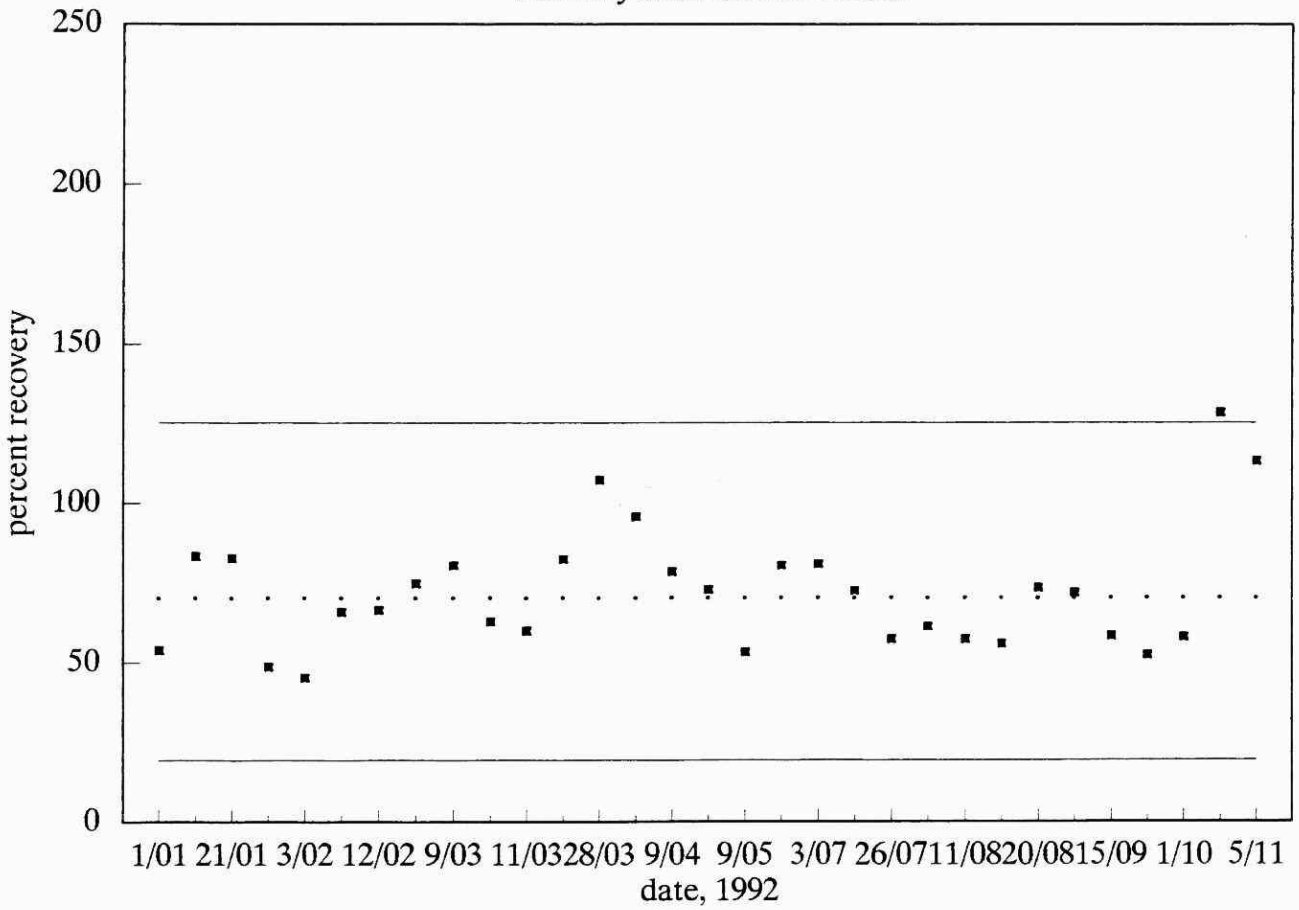
. . . . average recovery
____ 99% confidence limits

Method Performance Summary January - December 1992

Analyte	mirex
True Concentration	100 ng/L
Number of Observations	219
Between-run Standard Deviation	25%
Accuracy (% of expected)	118%

total PCB (Aroclor 1254/ Aroclor 1260)

recovery from fortified blank



. . . . average recovery
____ 99% confidence limits

Method Performance Summary January - December 1992

Analyte	total PCB (aroclor 1254/ aroclor 1260)
True Concentration	200 ng/L
Number of Observations	31
Between-run Standard Deviation	19%
Accuracy (% of expected)	72%

METHOD CODE : OWCP-B-E3119A
METHOD TITLE: The Determination of Chlorophenols and Phenoxyacid Herbicides in Water by Solid Phase Extraction (SPE) and GC-ECD

LABORATORY : Organic Water Unit
SUPERVISOR : P. Crozier / Dr. D. Hall

SAMPLE TYPE : surface water, groundwater, raw and treated drinking water

PRINCIPLE OF THE METHOD :

The aqueous sample is aspirated through C-18 bonded porous silica cartridge. The cartridge is eluted with a small volume of solvent. The eluate is methylated and the 2,4-D type herbicides and chlorophenols are determined as the corresponding methyl esters and ethers by dual capillary gas chromatography with electron capture detection.

PARAMETERS MEASURED :	**LIS TEST CODE**	**W (ng/L)**	**T (ng/L)**
2,4,6-trichlorophenol	X3246	20	200
2,4,5-trichlorophenol	X3245	100	1 000
2,3,4-trichlorophenol	X3234	100	1 000
2,3,5,6-tetrachlorophenol	X32356	10	100
2,3,4,5-tetrachlorophenol	X32345	20	200
pentachlorophenol	X3PCPH	10	100
Dicamba	P3DICA	50	500
2,4-dichlorophenoxypropanoic acid	P324DP	100	1 000
2,4-dichlorophenoxyacetic acid	P324D	100	1 000
Silvex	P3SILV	20	200
2,4,5-trichlorophenoxyacetic acid	P3245T	50	500
2,4-dichlorophenoxybutyric acid	P324DB	200	2 000

REPORTING FORMAT :

Results are reported in parts per trillion (ng/L) rounded off to the closest increment of W and up to maximum of two significant figures.

QUALITY CONTROL :

Quality control samples included in the run format are method blanks, fortified method blanks and calibration check solutions.

For selected target compounds, control charts summarizing the response factors used to calibrate instruments and the recoveries from fortified method blanks are maintained.

REMARKS : In addition to the intra-laboratory method control, the performance of the method was

examined through performance audit samples program organized by LSB Quality Management Office.

List of Performance Charts : 2,4,6-Trichlorophenol (recovery from fortified blank)
2,4-Dichlorophenoxyacetic Acid (recovery from fortified blank)
Silvex (recovery from fortified blank)

List of Performance Tables : Method Blanks Summary
2,4,6-Trichlorophenol
2,4-Dichlorophenoxyacetic Acid
Silvex

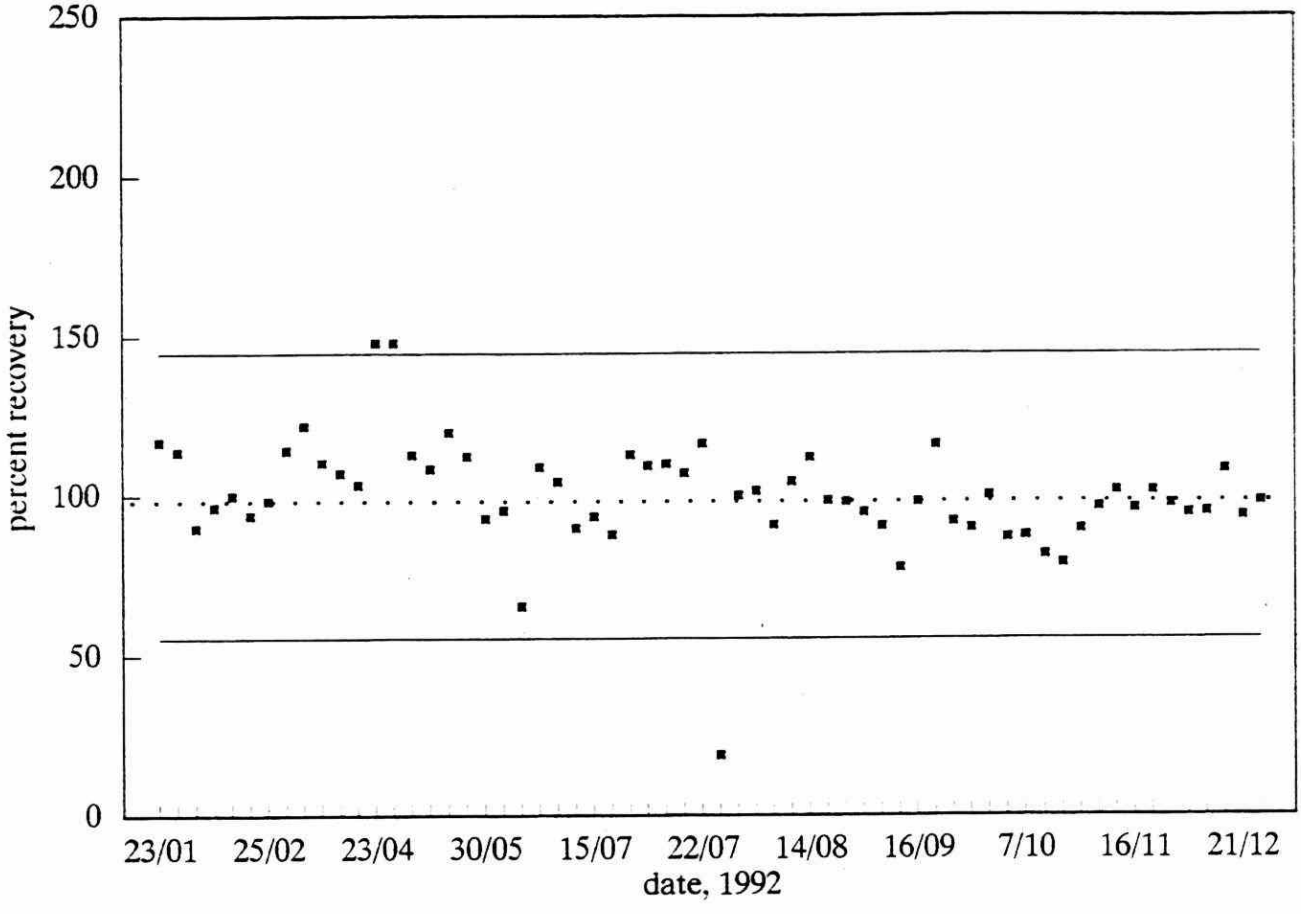
Method Blanks Summary January 1992 - December 1992

Analyte	Number of Observations	Average Concentration (ng/L)	Standard Deviation (ng/L)
2,4,6-trichlorophenol	63	ND (2)	
2,4,5-trichlorophenol	63	ND (3)	
2,3,4-trichlorophenol	63	ND (2)	
2,3,5,6-tetrachlorophenol	63	ND (1)	
2,3,4,5-tetrachlorophenol	63	0.7	1.7
pentachlorophenol	63	5	13
Dicamba	63	ND (3)	
2,4-dichlorophenoxypropanoic acid	63	ND (10)	
2,4-dichlorophenoxyacetic acid	63	ND (10)	
Silvex	63	ND (2)	
2,4,5-trichlorophenoxyacetic acid	63	ND (2)	
2,4-dichlorophenoxybutyric acid	63	ND (20)	
Picloram	63	ND (2)	

ND ... Not detected. Detection limit in ng/L given in brackets ( ).

2,4,6–trichlorophenol

recovery from fortified blank



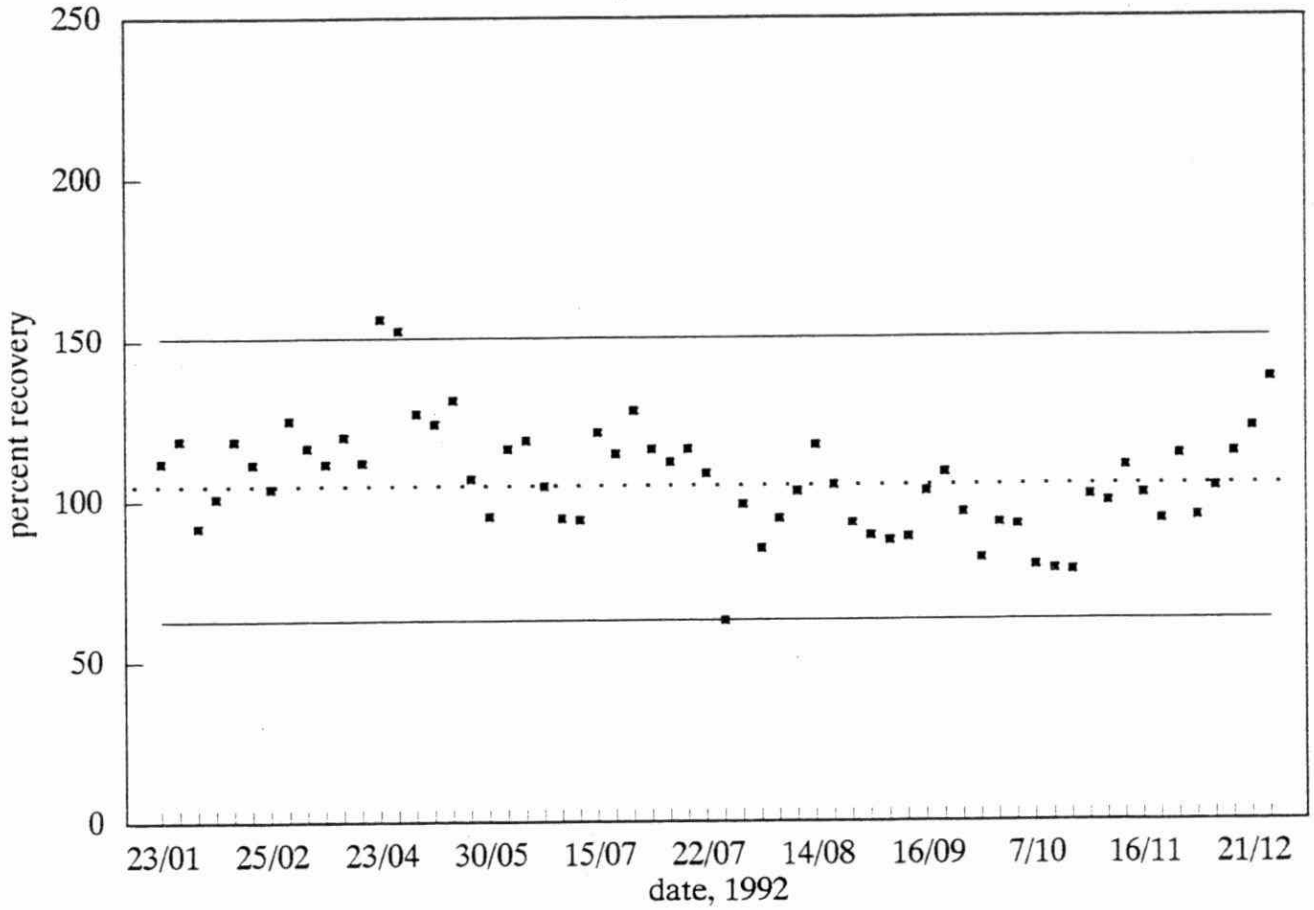
. . . . average recovery
____ 99% confidence limits

Method Performance Summary January - December 1992

Analyte	2,4,6-trichlorophenol
True Concentration	100 ng/L
Number of Observations	62
Between-run Standard Deviation	17%
Accuracy (% of expected)	100%

2,4–dichlorophenoxyacetic acid

recovery from fortified blank



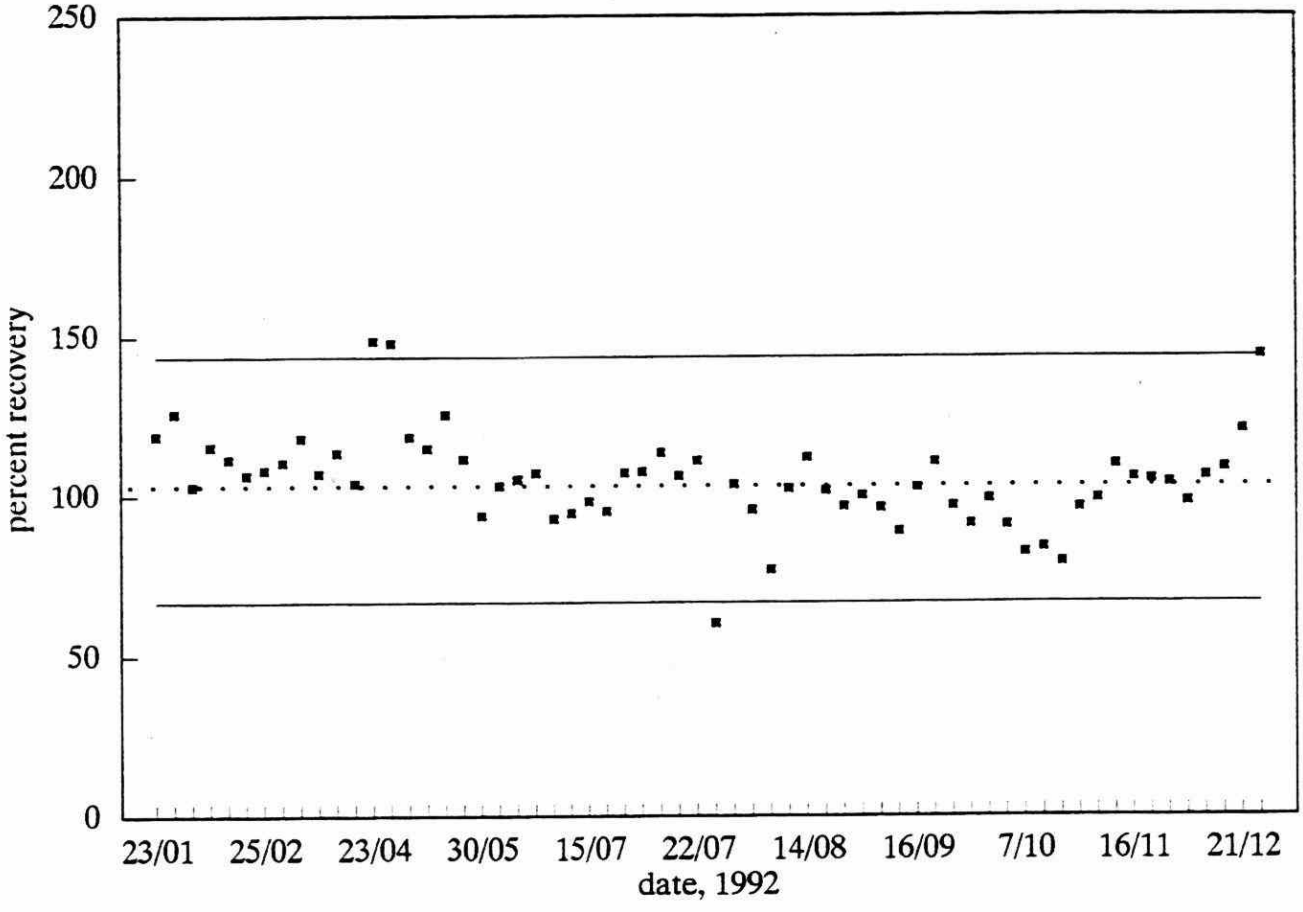
. . . . average recovery
____ 99% confidence limits

Method Performance Summary January - December 1992

Analyte	2,4-dichlorophenoxyacetic acid
True Concentration	750 ng/L
Number of Observations	62
Between-run Standard Deviation	17%
Accuracy (% of expected)	107%

silvex

recovery from fortified blank



. . . . average recovery
____ 99% confidence limits

Method Performance Summary January - December 1992

Analyte	silvex
True Concentration	150 ng/L
Number of Observations	62
Between-run Standard Deviation	14%
Accuracy (% of expected)	105%

METHOD CODE : OWTRI-E3121A
METHOD TITLE: The Determination of Triazine Herbicides in Water by GC-TSD

LABORATORY : Organic Water
SUPERVISOR : P. Crozier / Dr. D. Hall

SAMPLE TYPE : surface water, groundwater, raw and treated drinking water

PRINCIPLE OF THE METHOD :

Sample pH is adjusted to 12 and the triazine herbicides are extracted with an organic solvent. The extract is dried and then evaporated to dryness. The reconstituted extract is examined by gas chromatography using a thermionic specific detector.

PARAMETERS MEASURED :	LIS TEST CODE	W (ng/L)	T (ng/L)
prometon	P2PROM	50	500
atraton	P2ATRO	50	500
propazine	P2PROP	50	500
atrazine	P2ATRA	50	500
prometryne	P2PROY	50	500
simazine	P2SIM	50	500
ametryne	P2AMET	50	500
sencor	P2SENC	100	1 000
bladex	P2BLAD	100	1 000
metolachlor	P0MET	500	5 000
alachlor	P0LASS	500	5 000
desethyl atrazine	P2DATR	200	2 000
desethyl simazine	P2DSIM	200	2 000

REPORTING FORMAT :

Results are reported in parts per trillion (ng/L) rounded off to the closest increment of W up to maximum of two significant figures.

QUALITY CONTROL :

The routine quality control operations monitor validity of calibration (calibration check solution), maintenance of required instrument sensitivity (low level check solution), absence of potential interferences (method blanks) and overall method performance (fortified method blanks).

Control charts summarizing the response factors used to calibrate instruments and the recoveries from fortified method blanks are maintained for selected target compounds.

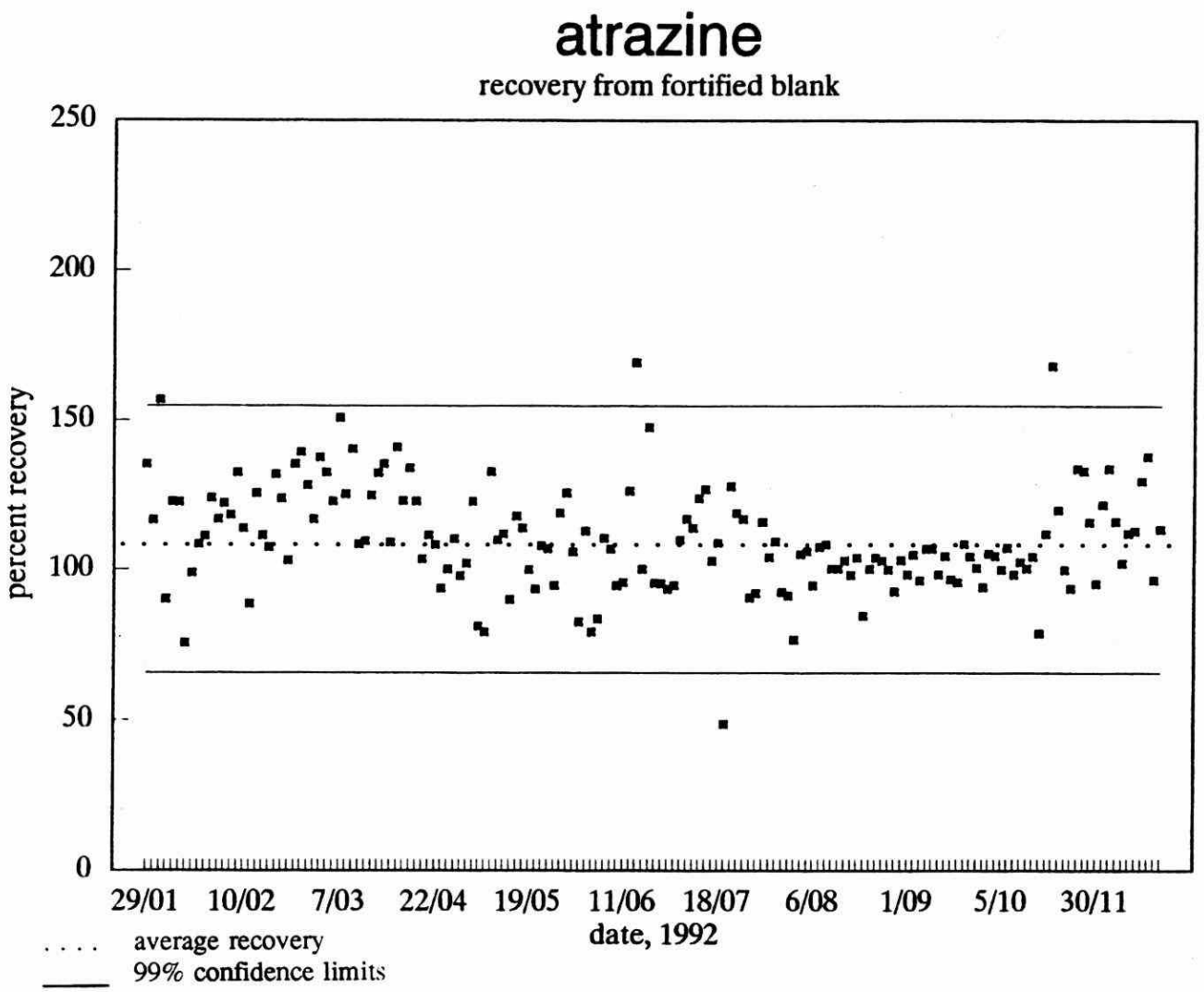
REMARKS : During the period starting January 1992 and ending December 1992, a total of 172 procedure blanks were prepared and tested by the method. For these 172 analyses, no observable responses of any of the target analytes were encountered.

In addition to the intra-laboratory method control, the performance of the method was examined through performance audit samples program organized by LSB Quality Management Office.

In July 1992, the performance of the method was examined through the CAPCO Interlaboratory QC Study organized by the National Water Research Institute.

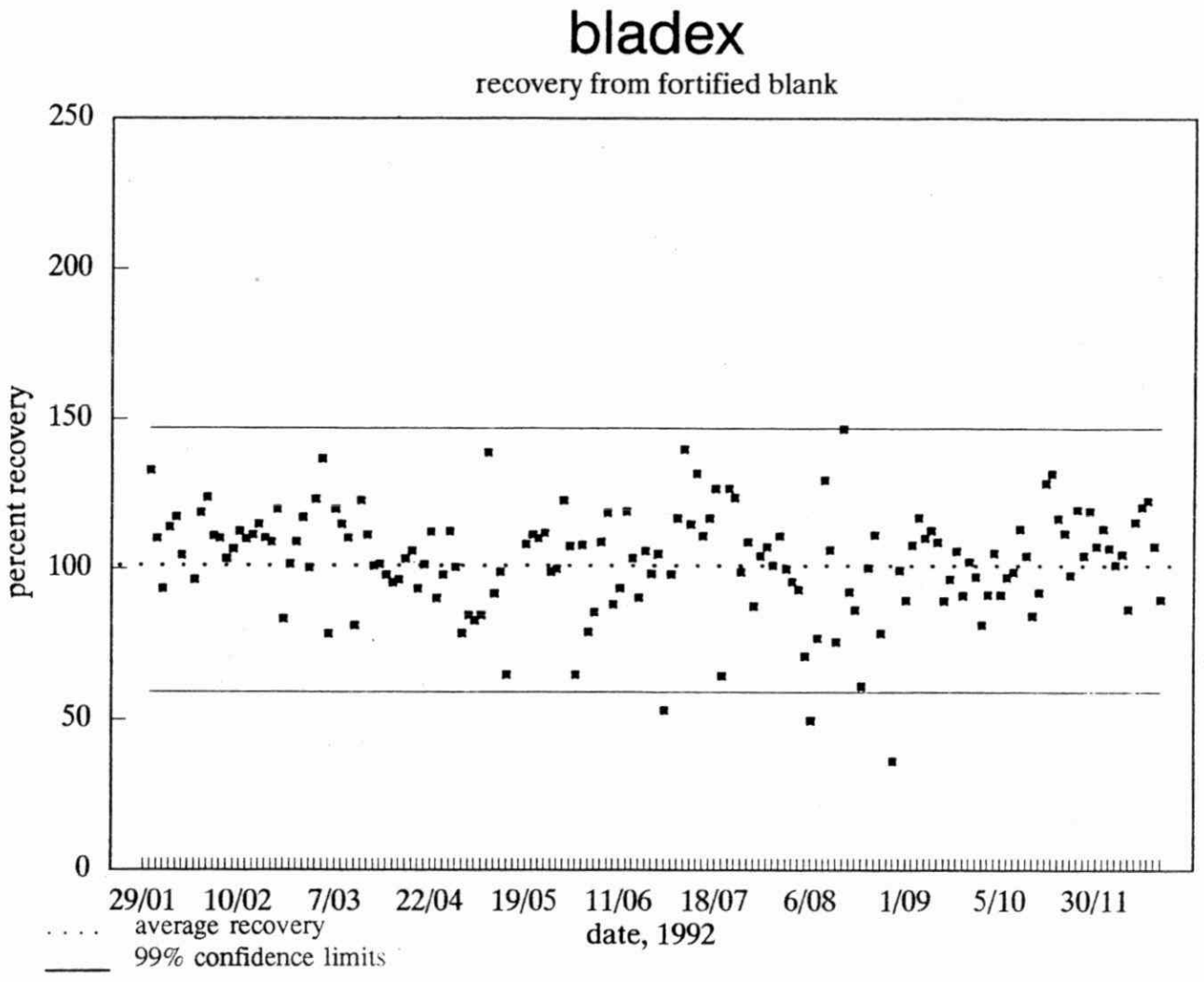
List of Performance Charts and Tables:

Atrazine (recovery from fortified blank)
Bladex (recovery from fortified blank)
Metolachlor (recovery from fortified blank)



Method Performance Summary January - December 1992

Analyte	atrazine
True Concentration	200 ng/L
Number of Observations	161
Between-run Standard Deviation	18%
Accuracy (% of expected)	110%

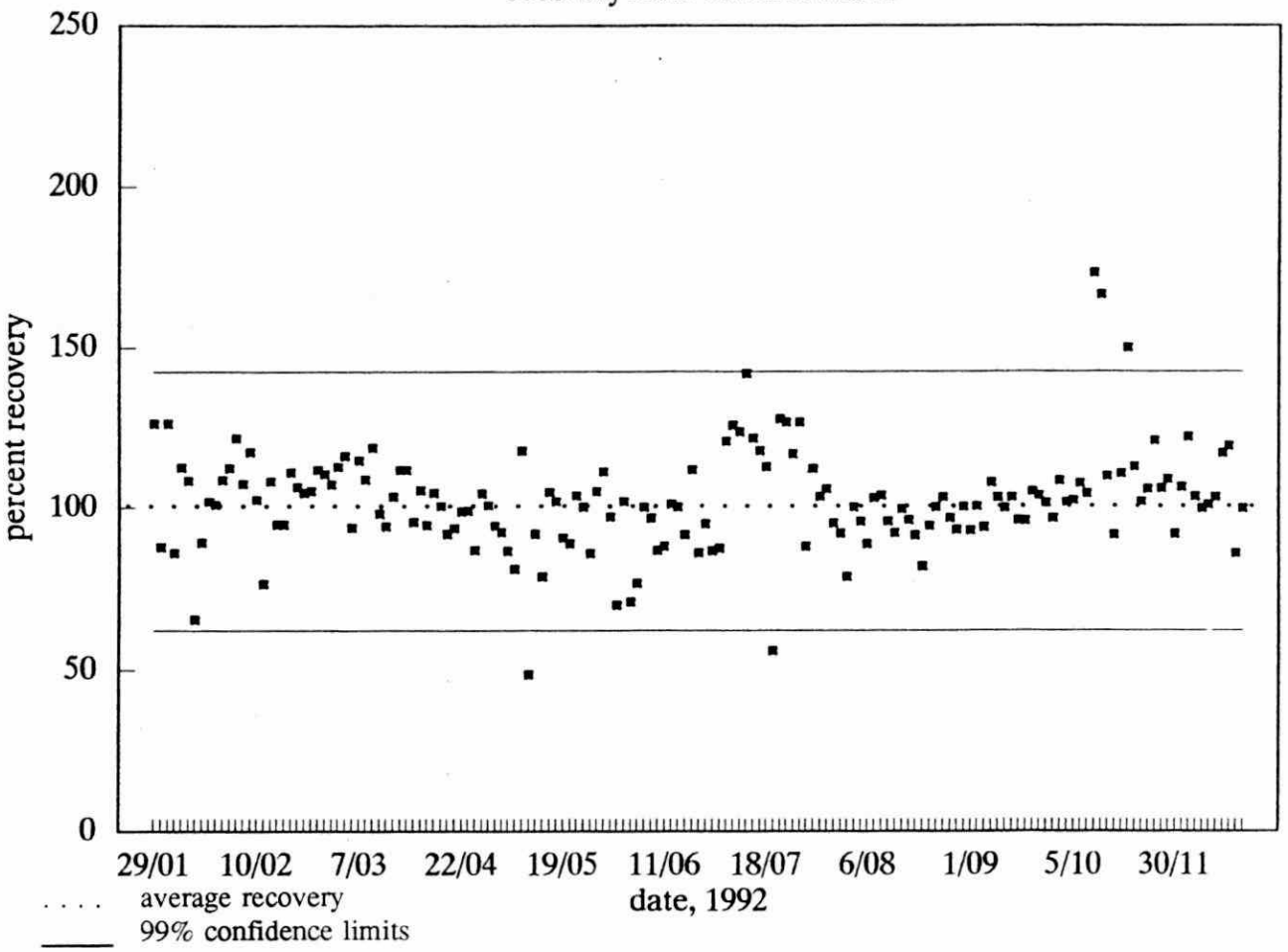


Method Performance Summary January - December 1992

Analyte	bladex
True Concentration	200 ng/L
Number of Observations	156
Between-run Standard Deviation	17%
Accuracy (% of expected)	103%

metolachlor

recovery from fortified blank



Method Performance Summary January - December 1992

Analyte	metolachlor
True Concentration	1 000 ng/L
Number of Observations	161
Between-run Standard Deviation	16%
Accuracy (% of expected)	102%

METHOD CODE : PWAOP-E32224A
METHOD TITLE: The Determination of Organophosphorus Pesticides in Water by GC-TSD

LABORATORY : Organic Water Unit
SUPERVISOR : P. Crozier / Dr. D. Hall

SAMPLE TYPE : surface water, groundwater, raw and treated drinking water

PRINCIPLE OF THE METHOD :

Samples are extracted with an organic solvent; water is removed from extract and extract is evaporated to dryness. The reconstituted extract is examined by dual capillary gas chromatography with a thermionic specific detector.

PARAMETERS MEASURED :	LIS TEST CODE	W (ng/L)	T (ng/L)
methyl trithion	P4MTRI	20	200
dichlorvos	P4DICH	20	200
mevinphos	P4MEVI	20	200
phorate (thimet)	P4PHOR	20	200
diazinon	P4DIAZ	20	200
ronnel	P4RONN	20	200
chlorpyriphos (dursban)	P4DURS	20	200
reldan	P4RELD	20	200
malathion	P4MALA	20	200
parathion	P4PARA	20	200
methyl parathion	P4MPAR	50	500
ethion	P4ETHI	20	200

REPORTING FORMAT :

Results are reported in parts per trillion (ng/L) rounded off to the closest increment of W and up to maximum of two significant figures.

QUALITY CONTROL :

The routine quality control operations monitor validity of calibration (calibration check solution), absence of potential interferences (method blanks), overall method performance (fortified method blanks).

For selected target compounds, control charts summarizing the response factors used to calibrate instruments and the recoveries from fortified method blanks are maintained.

REMARKS : During the period starting January 1992 and ending December 1992, a total of 25 method blanks were prepared and tested by the method. For these 25 analyses, no observable responses of any of the target analytes were encountered.

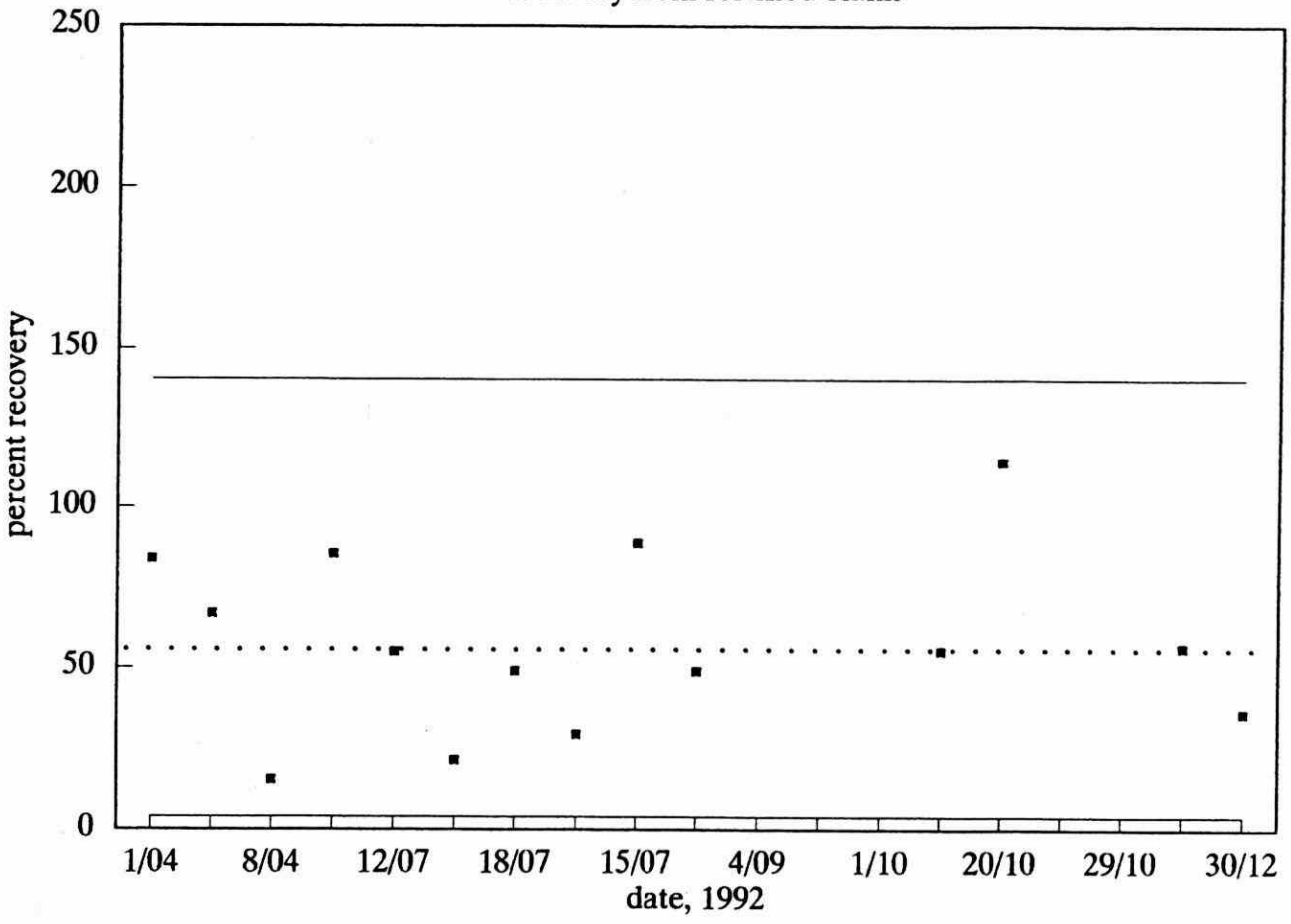
In addition to the intra-laboratory method control, the performance of the method was examined through performance audit samples program organized by LSB Quality Management Office.

List of Performance Charts : Dichlorvos (recovery from fortified blank)
Diazinon (recovery from fortified blank)
Ethion (recovery from fortified blank)

List of Performance Tables : Dichlorvos
Diazinon
Ethion

dichlorvos

recovery from fortified blank

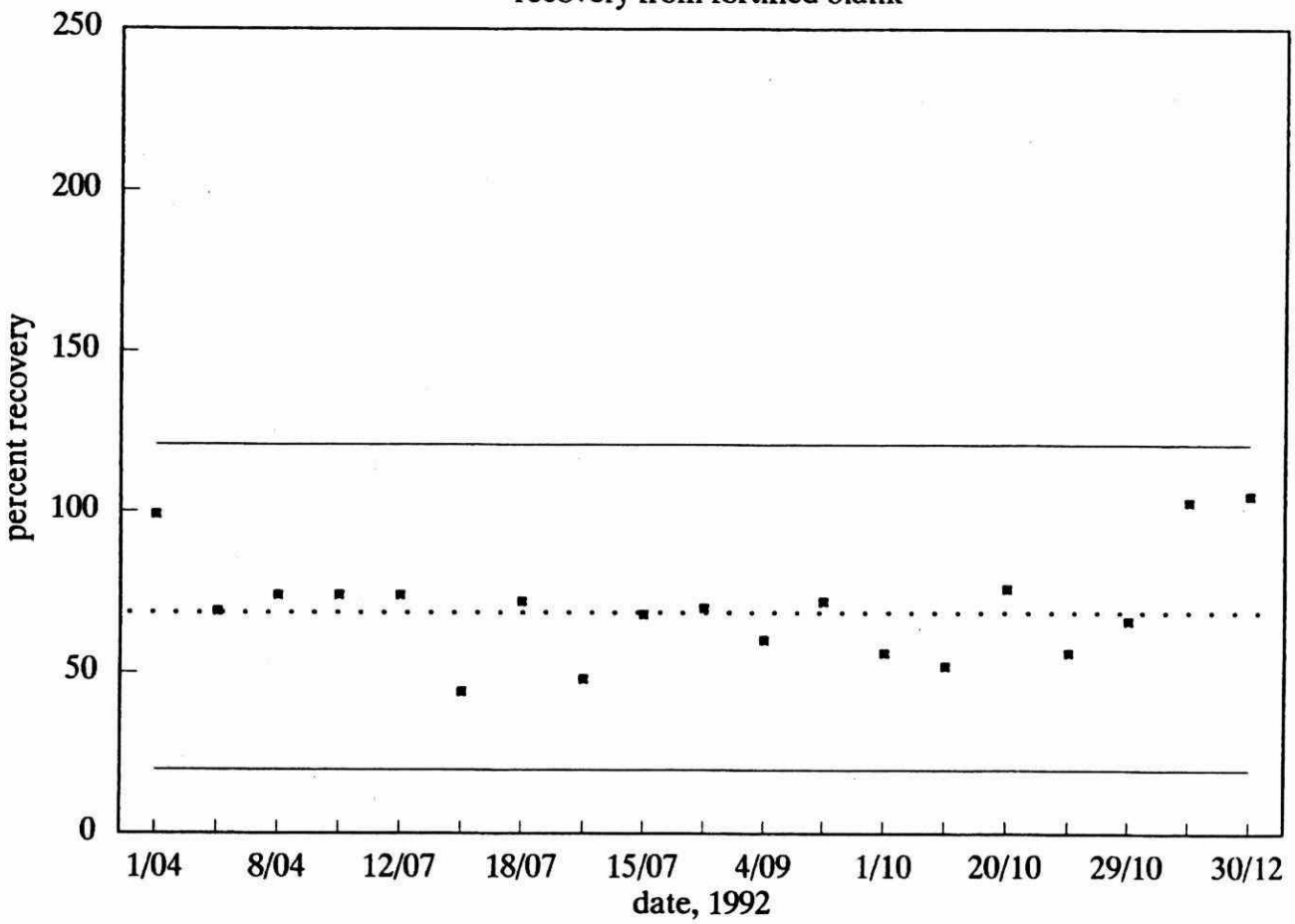


Method Performance Summary January - December 1992

Analyte	dichlorvos
True Concentration	100 ng/L
Number of Observations	14
Between-run Standard Deviation	27%
Accuracy (% of expected)	58%

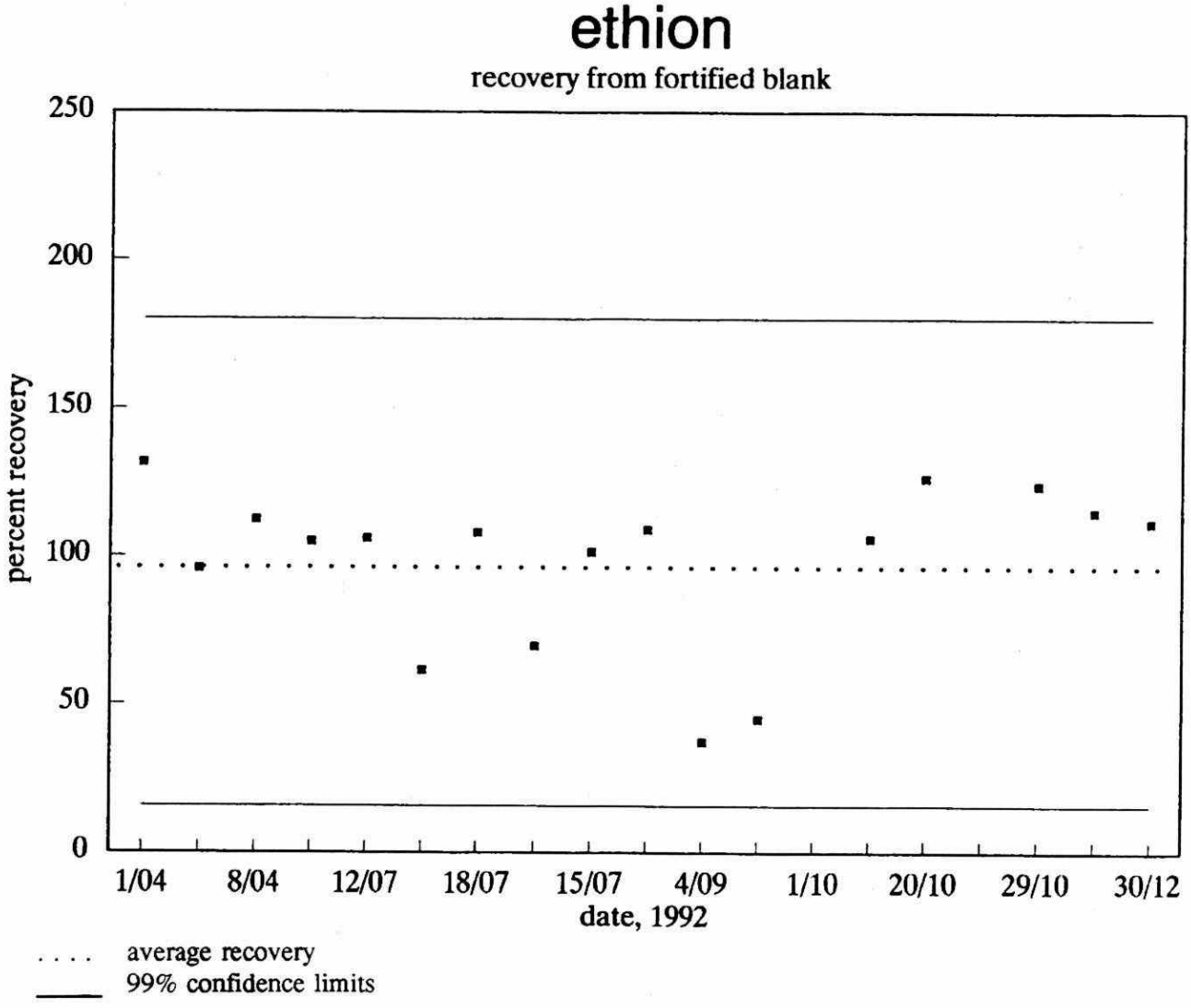
diazinon

recovery from fortified blank



Method Performance Summary January - December 1992

Analyte	diazinon
True Concentration	100 ng/L
Number of Observations	19
Between-run Standard Deviation	17%
Accuracy (% of expected)	70%



Method Performance Summary January - December 1992

Analyte	ethion
True Concentration	200 ng/L
Number of Observations	17
Between-run Standard Deviation	36%
Accuracy (% of expected)	89%

METHOD CODE : HPLC/L-E3086A
METHOD TITLE: The Determination of Polynuclear Aromatic Hydrocarbons (PAHs) in Water by HPLC - Fluorescence Detection

LABORATORY : Organic Water Unit
SUPERVISOR : P. Crozier / Dr. D. Hall

SAMPLE TYPE : surface water, groundwater, raw and treated drinking water

PRINCIPLE OF THE METHOD :

Sample is extracted with an organic solvent; the extract is dried and evaporated to dryness. The reconstituted extract is examined by high performance liquid chromatography equipped with fluorescence detector.

PARAMETERS MEASURED :	LIS TEST CODE	W (ng/L)	T (ng/L)
phenanthrene	B3001X	10	100
anthracene	B3002X	1	10
fluoranthene	B3003X	20	200
pyrene	B3004X	20	200
benzo(a)anthracene	B3005X	20	200
chrysene	B3006X	50	500
dimethylbenz(a)anthracene	B3007X	5	50
benzo(e)pyrene	B3008X	50	500
benzo(b)fluoranthene	B3010X	10	100
perylene	B3011X	10	100
benzo(k)fluoranthene	B3012X	1	10
benzo(a)pyrene	B3013X	5	50
benzo(g,h,i)perylene	B3014X	20	200
dibenzo(a,h)anthracene	B3015X	10	100
indeno(1,2,3-c,d)pyrene	B3016X	20	200
benzo(b)chrysene	B3017X	2	20
coronene	B3019X	10	100

REPORTING FORMAT :

Results are reported in parts per trillion (ng/L) rounded off to the closest increment of W and up to maximum of two significant figures.

QUALITY CONTROL :

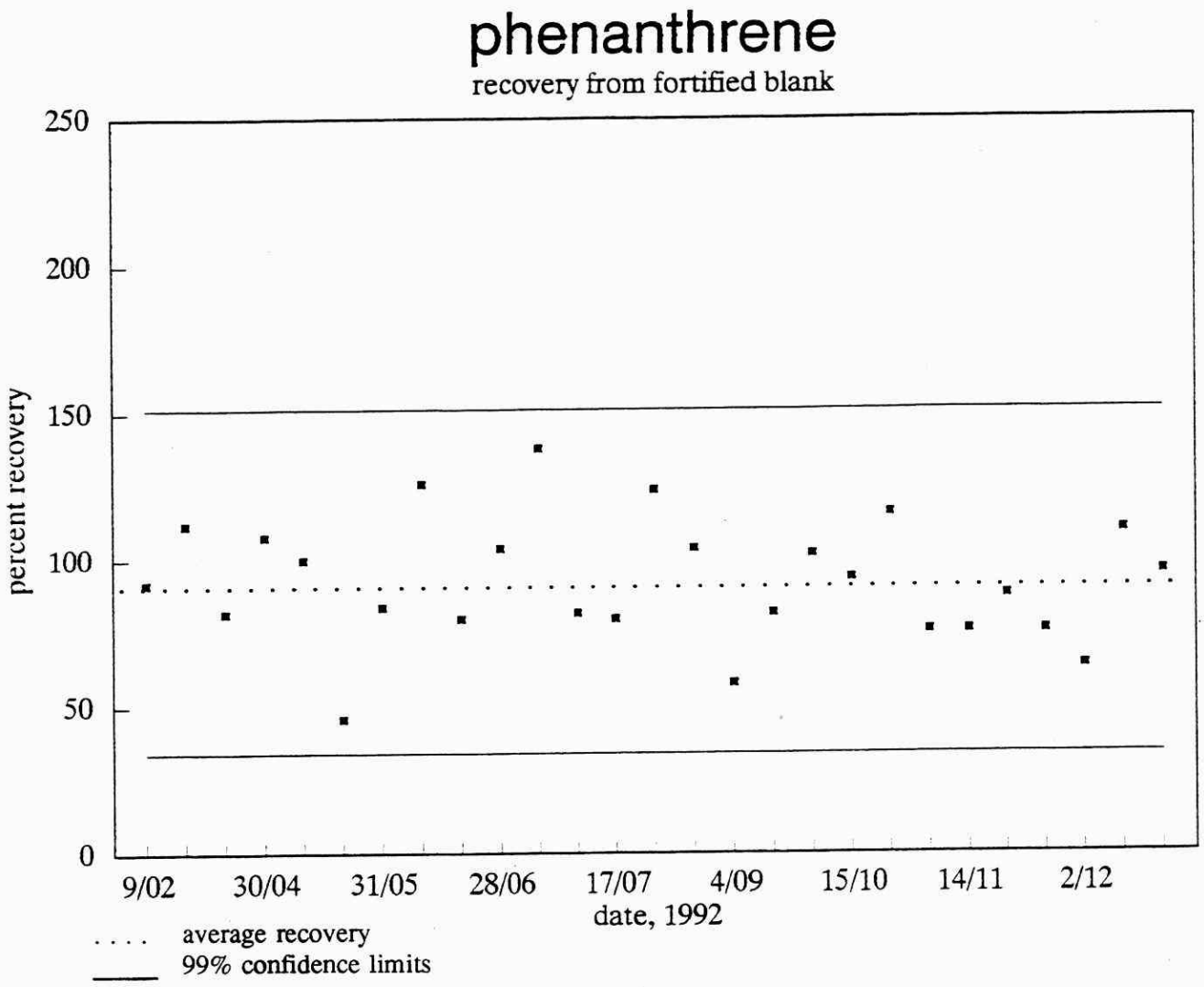
The routine quality control operations monitor validity of calibration (calibration check solution), absence of potential interferences (method blanks), overall method performance (fortified method blanks).

For selected target compounds, control charts summarizing the response factors used to calibrate instruments and the recoveries from fortified method blanks are maintained.

REMARKS : During the period starting January 1992 and ending December 1992, a total of 26 method blanks was prepared and tested by the method. For these 26 analyses, no observable responses of any of the target analytes were encountered.

List of Performance Charts :
Phenanthrene (recovery from fortified blank)
Benzo(b)fluoranthene / Perylene (recovery from fortified blank)
Benzo(a)pyrene (recovery from fortified blank)

List of Performance Tables :
Phenanthrene
Benzo(b)fluoranthene / Perylene
Benzo(a)pyrene

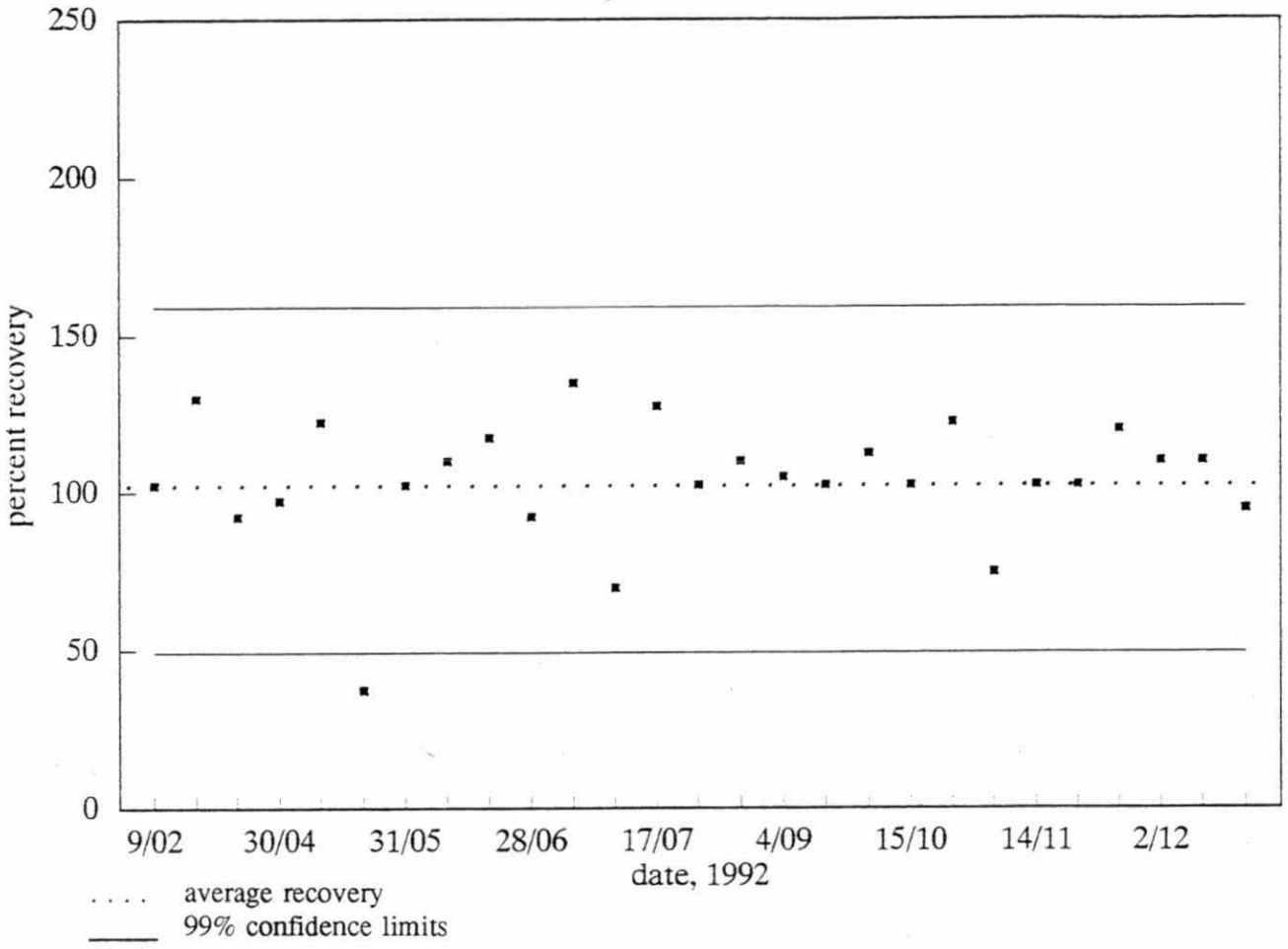


Method Performance Summary January - December 1992

Analyte	phenanthrene
True Concentration	50 ng/L
Number of Observations	27
Between-run Standard Deviation	21%
Accuracy (% of expected)	93%

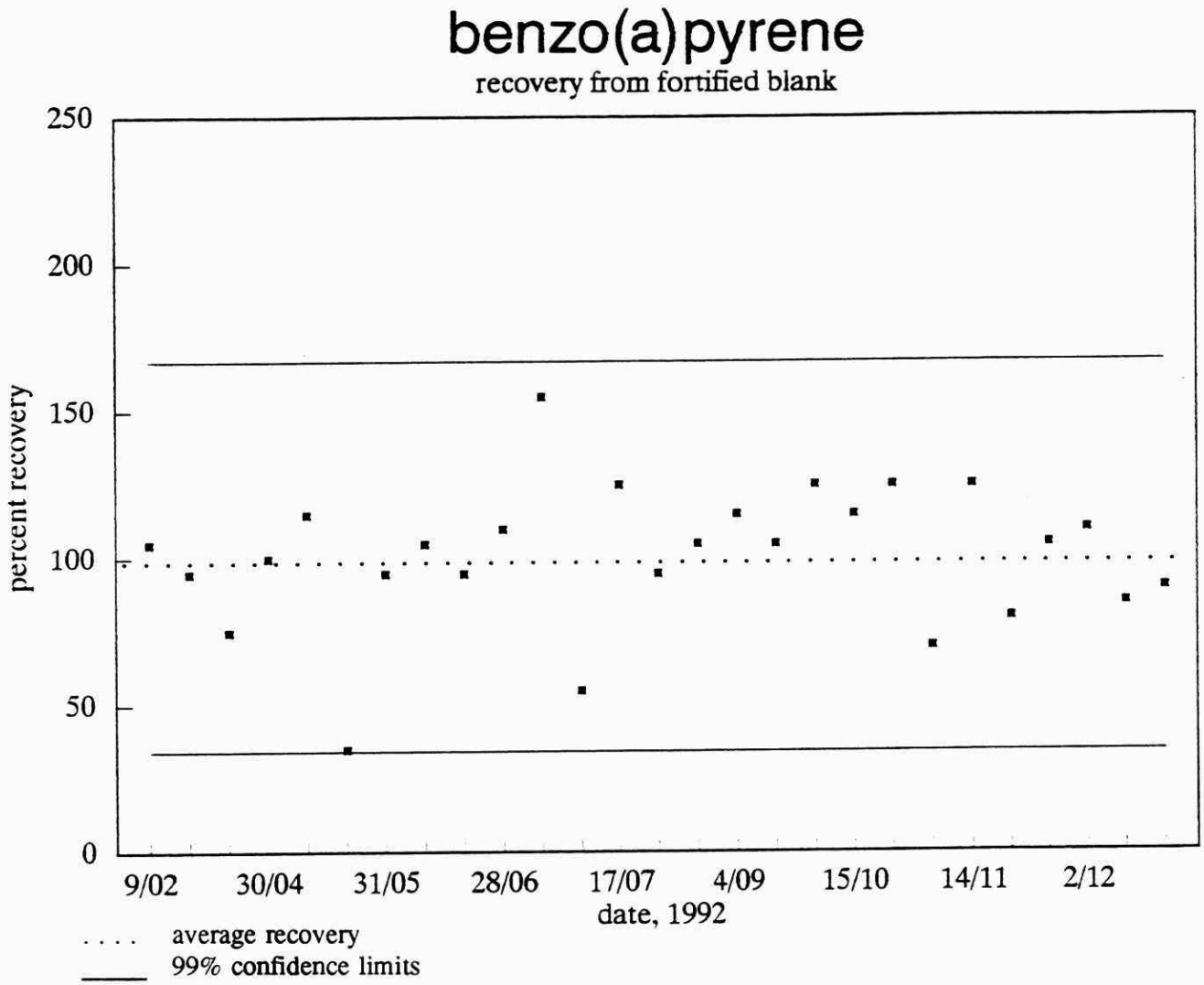
benzo(b)fluoranthene/perylene

recovery from fortified blank



Method Performance Summary January - December 1992

Analyte	benzo(b)fluoranthene/perylene
True Concentration	40 ng/L
Number of Observations	27
Between-run Standard Deviation	20%
Accuracy (% of expected)	104%



Method Performance Summary January - December 1992

Analyte	benzo(a)pyrene
True Concentration	20 ng/L
Number of Observations	27
Between-run Standard Deviation	24%
Accuracy (% of expected)	101%

METHOD CODE : PWACAR-E3158A
METHOD TITLE: The Determination of Carbamates in Water by HPLC - UV Detection

LABORATORY : Organic Water Unit
SUPERVISOR : P. Crozier / Dr. D. Hall

SAMPLE TYPE : surface water, groundwater, raw and treated drinking water

PRINCIPLE OF THE METHOD :

Sample is extracted with an organic solvent; the extract is dried and evaporated to dryness. The reconstituted extract is examined by high performance liquid chromatography, using a variable wavelength ultraviolet detector.

PARAMETERS MEASURED :	LIS TEST CODE	W (ng/L)	T (ng/L)
carbofuran	P6CARB	2 000	20 000
carbaryl	P6SEVN	200	2 000
butylate	P6SUTN	2 000	20 000
propoxur	P6PROP	2 000	20 000
isopropyl-3-chlorophenyl carbamate	P6CIPC	2 000	20 000
isopropyl phenyl carbamate	P6IPC	2 000	20 000
diallate	P6DIAL	2 000	20 000
eptam	P6EPTM	2 000	20 000

REPORTING FORMAT :

Results are reported in parts per trillion (ng/L) rounded off to the closest increment of W up to maximum of two significant figures.

QUALITY CONTROL :

The routine quality control operations monitor validity of calibration (calibration check solution), absence of potential interferences (method blanks), overall method performance (fortified method blanks).

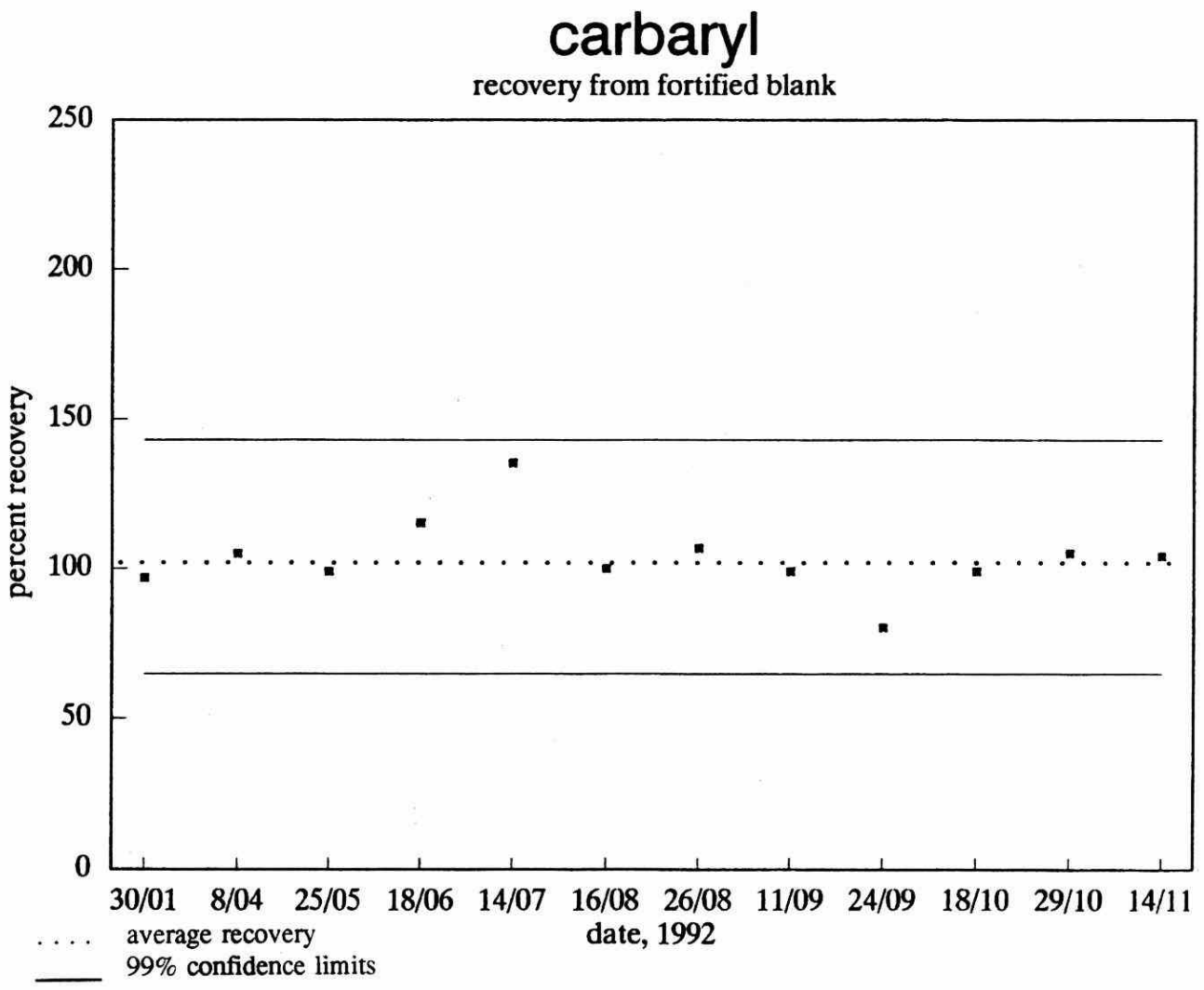
Control charts summarizing the response factors used to calibrate instruments and the recoveries from fortified method blanks are maintained for selected target compounds.

REMARKS : During the period starting January 1992 and ending December 1992, a total of 13 method blanks was prepared and tested by the method. For these 13 analyses, no observable responses of any of the target analytes were encountered.

In addition to the intra-laboratory method control, the performance of the method was examined through performance audit samples program organized by LSB Quality Management Office.

List of Performance Charts : Carbaryl (recovery from fortified blank)
Isopropyl-3-chlorophenyl Carbamate (recovery from fortified blank)
Butylate (recovery from fortified blank)

List of Performance Tables : Carbaryl
Isopropyl-3-chlorophenyl Carbamate
Butylate

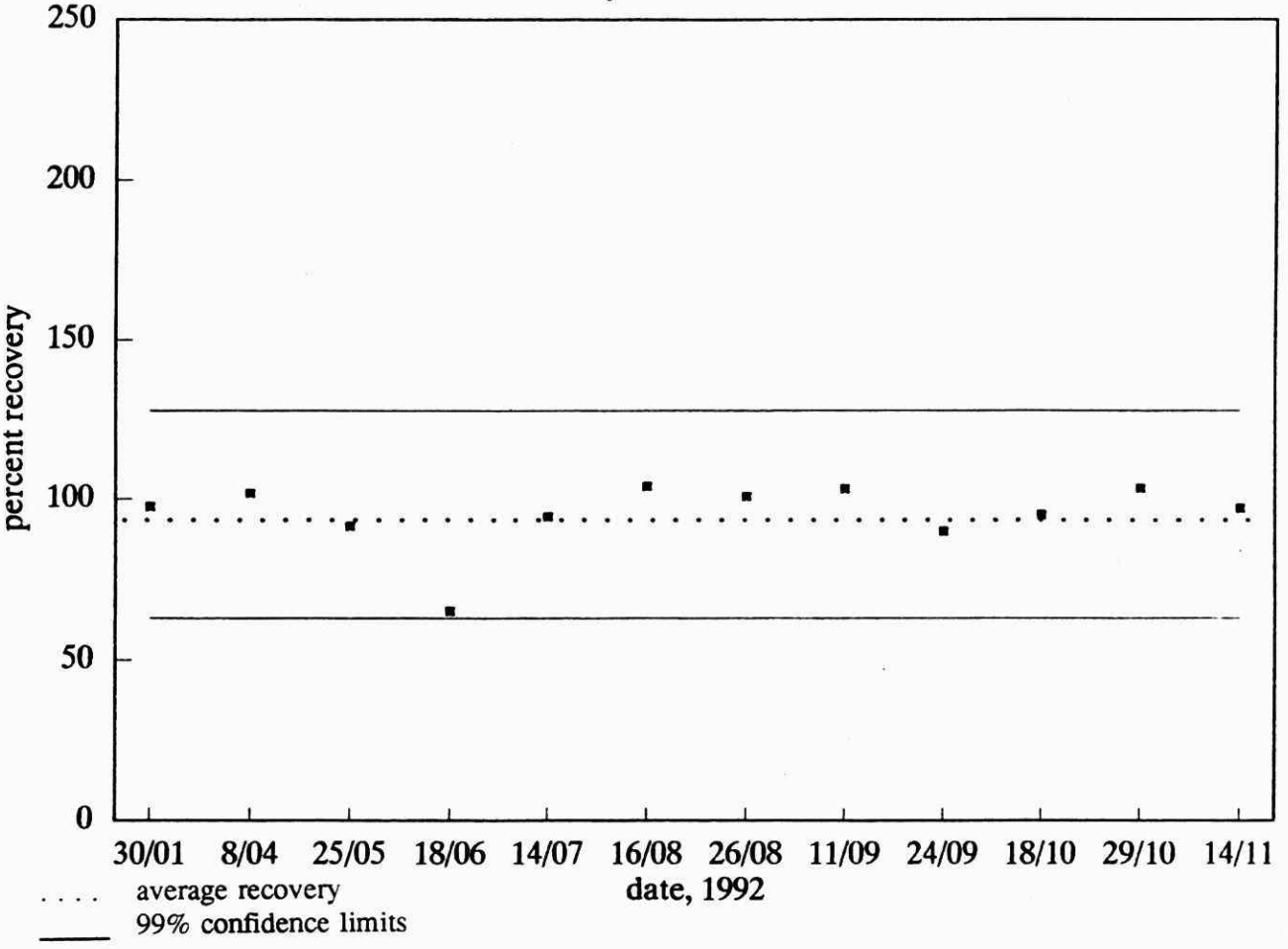


Method Performance Summary January - December 1992

Analyte	carbaryl
True Concentration	10 000 ng/L
Number of Observations	12
Between-run Standard Deviation	13%
Accuracy (% of expected)	104%

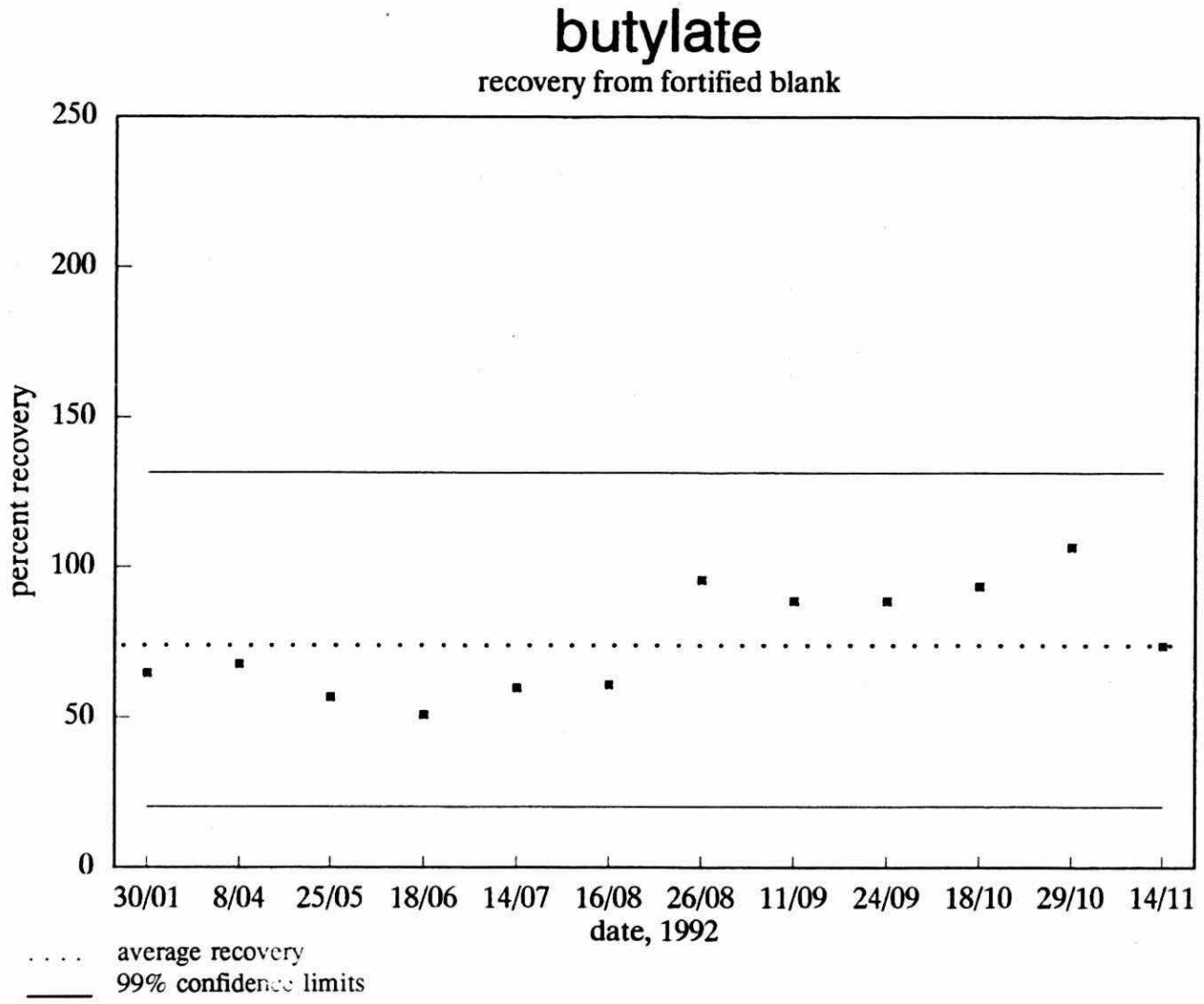
isopropyl–3–chlorophenyl carbamate

recovery from fortified blank



Method Performance Summary January - December 1992

Analyte	isopropyl-3-chlorophenyl carbamate
True Concentration	5 000 ng/L
Number of Observations	12
Between-run Standard Deviation	11%
Accuracy (% of expected)	95%



Method Performance Summary January - December 1992

Analyte	butylate
True Concentration	5 000 ng/L
Number of Observations	12
Between-run Standard Deviation	18%
Accuracy (% of expected)	76%

METHOD CODE : PWAUH-E3230A
METHOD TITLE: The Determination of Phenyl Ureas in Water by HPLC - UV Detection

LABORATORY : Organic Water Unit
SUPERVISOR : P. Crozier / Dr. D. Hall

SAMPLE TYPE : surface water, groundwater, raw and treated drinking water

PRINCIPLE OF THE METHOD :

Samples are extracted with an organic solvent; the extract is filtered through granular anhydrous sodium sulphate to remove water and evaporated to dryness by rotary evaporator. The reconstitued extract is examined by high performance liquid chromatography using a variable wavelength ultraviolet detector.

PARAMETERS MEASURED :	LIS TEST CODE	W (ng/L)	T (ng/L)
linuron	P5LINU	2 000	20 000
monuron	P5MONU	2 000	20 000
diuron	P5DIUR	2 000	20 000
chlortoluron	P5CTOL	2 000	20 000
fluometuron	P5FMET	2 000	20 000
monolinuron	P5MLIN	2 000	20 000
chlorbromuron	P5CBRO	2 000	20 000
metoxuron	P5METX	2 000	20 000
siduron	P5SID	2 000	20 000
difenoxuron	P5DIF	2 000	20 000
neburon	P5NEB	2 000	20 000
metobromuron	P5PATO	2 000	20 000

REPORTING FORMAT :

Results are reported in parts per trillion (ng/L) rounded off to the closest increment of 100 ng/L and up to maximum of two significant figures.

QUALITY CONTROL :

The routine quality control operations monitor validity of calibration (calibration check solution), absence of potential interferences (method blanks), overall method performance (fortified method blanks).

REMARKS : During the period starting January 1991 and ending December 1991, one method blank was prepared and tested by the method. No observable responses of any of the target analytes were encountered.

Since this method is not used on regular basis (less than 50 samples are analyzed per year), no control charts are maintained.

List of Performance Charts : not applicable

List of Performance Tables : Recoveries of Target Analytes from Fortified Method Blanks

Performance Summary Table

Recoveries of PWAUH Target Analytes from Fortified Method Blanks

Analyte	concentration (ng/L)	number of obs.	accuracy (% of expected)
metoxuron	5 000	1	93%
monuron	5 000	1	90%
chlortoluron	5 000	1	101%
fluometuron	5 000	1	89%
diuron / monolinuron	10 000	1	101%
difenoxuron	5 000	1	98%
metobromuron	5 000	1	96%
siduron	5 000	1	96%
linuron	5 000	1	102%
chlorbromuron	5 000	1	101%
neburon	5 000	1	100%

METHOD CODE : NDMA-E3291A
METHOD TITLE: The Determination of N-Nitrosodimethylamine (NDMA) in Drinking Water and in Aqueous Samples by Gas Chromatography / High Resolution Mass Spectrometry (GC/HRMS)

LABORATORY : Mass Spectrometry Unit
SUPERVISOR : Dr. V. Taguchi

SAMPLE TYPE : drinking water, aqueous samples

PRINCIPLE OF THE METHOD :

The internal standard d_6-NDMA in added to an aliquot of the sample. After the pH is adjusted to 12 to keep the acidic components in the aqueous phase, the basic solution is serially extracted with dichloromethane. The dichloromethane extract is washed with a sulphuric acid solution to remove basic components from the organic phase. After being filtered through granular anhydrous sodium sulphate to remove water the extract is concentrated by rotary evaporator and a nitrogen evaporating unit.

The sample extract is analysed by GC/HRMS. NDMA is quantified by an isotope dilution method.

PARAMETERS MEASURED :	**LIS TEST CODE**	**MDL** (µg/L)
N-Nitrosodimethylamine	MSNDMA	0.005

REPORTING FORMAT :

Results are reported in µg/L rounded off to two significant figures. The lowest reported value is $5x10^{-3}$µg/L.

QUALITY CONTROL :

The routine quality control operations monitor overall method performance (spiked procedure blanks), size of potential positive bias (method blanks) and maintenance of the required instrument sensitivity.

REMARKS . he analytical method was modified in October 1992. Single point calibration was placed with a multi-point calibration.

In addition to the intra-laboratory method control, the performance of the method was examined through the performance audit samples program organized by the LSB Quality Management Office.

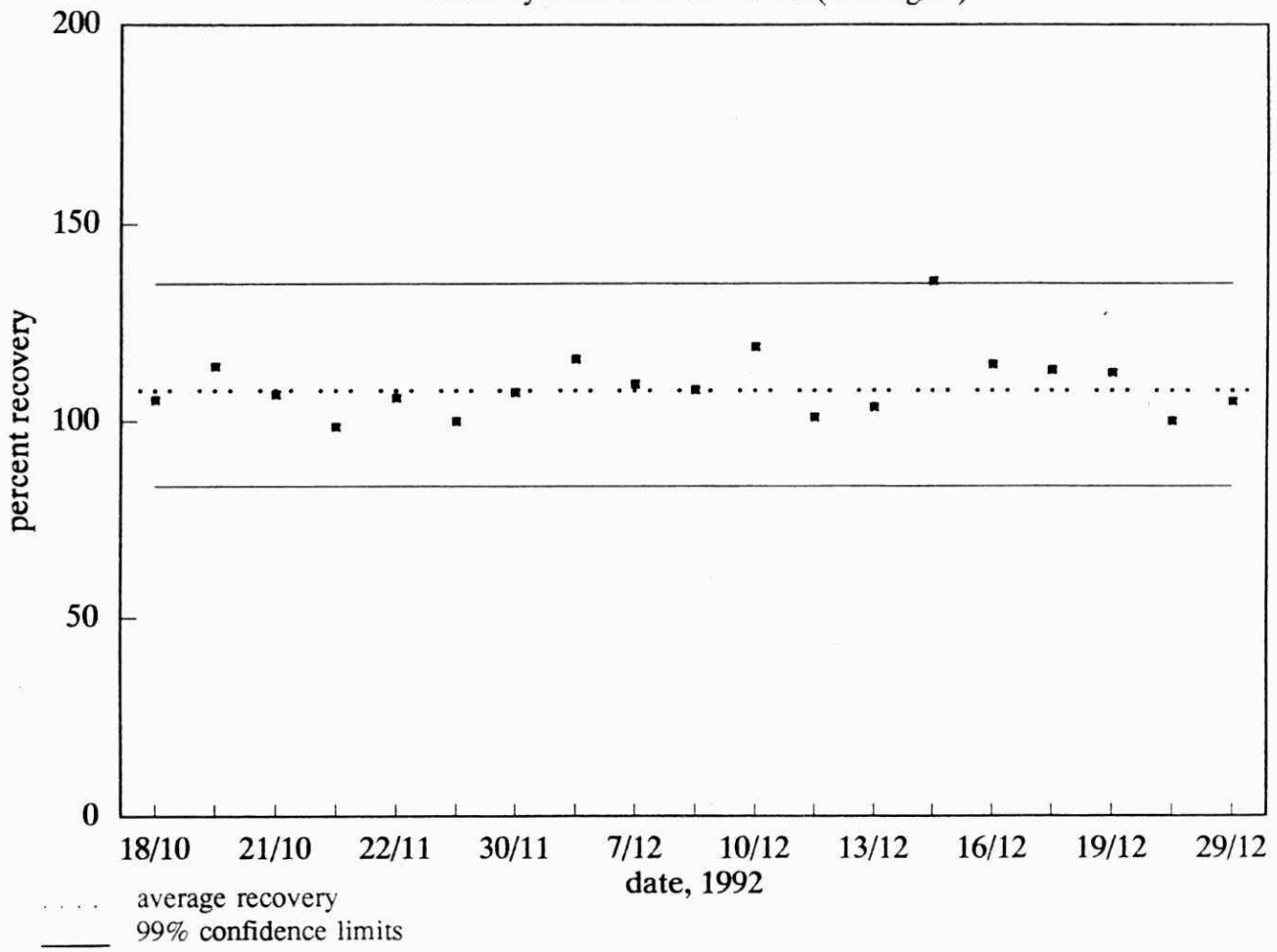
List of Performance Charts and Tables:

Method Blanks Summary January - December 1992

Analyte	N-nitrosodimethylamine
Number of Observations	183
Mean Concentration	1.4×10^{-3} µg/L
Standard Deviation	1.1×10^{-3} µg/L

N–nitrosodimethylamine

recovery from fortified blank (202 ng/L)

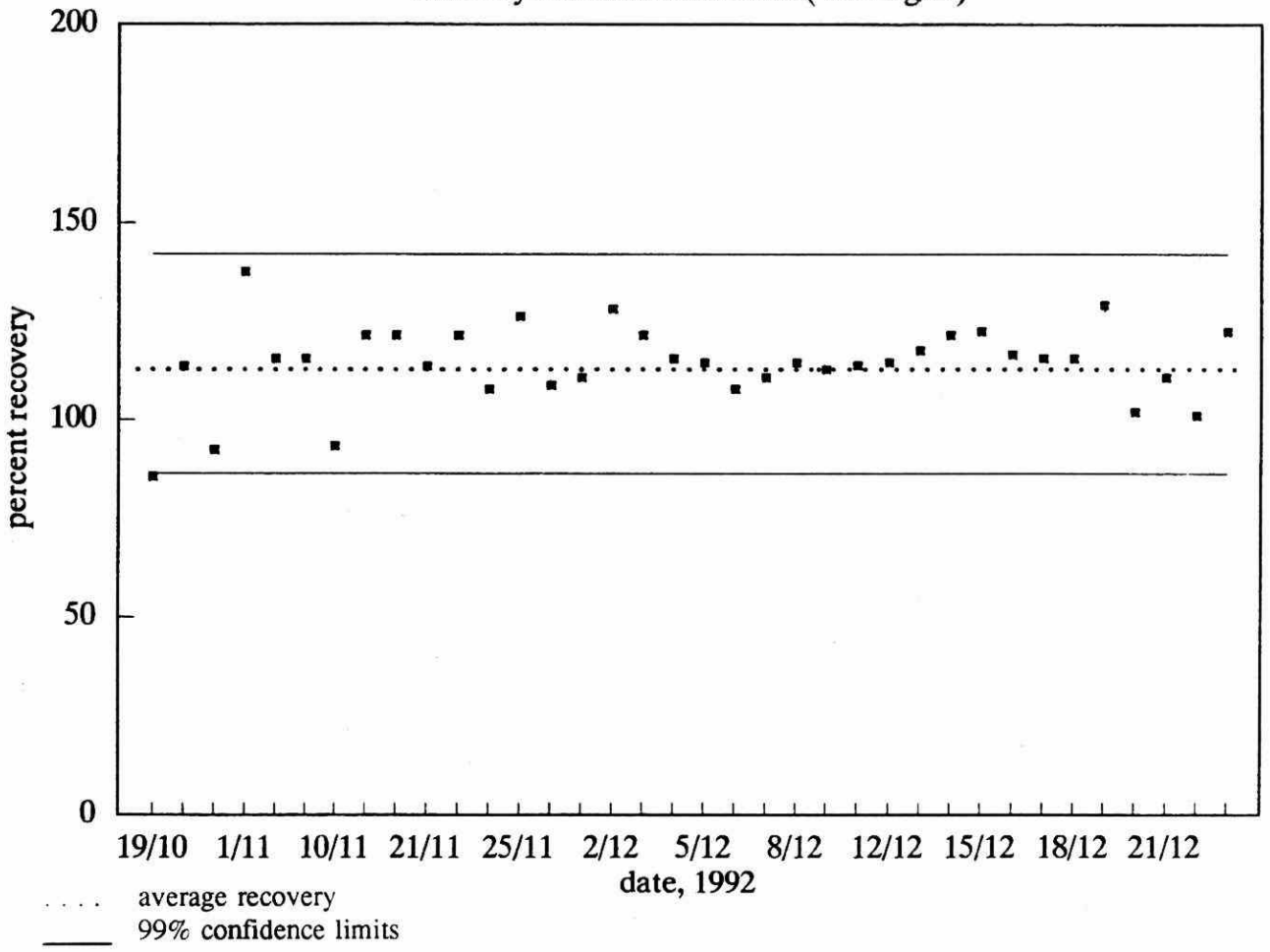


Method Performance Summary January - December 1992

Analyte	N-nitrosodimethylamine
True Concentration	0.202 µg/L
Number of Observations	19
Between-run Standard Deviation	8%
Accuracy (% of expected)	109%

N–nitrosodimethylamine

recovery from fortified blank (10.4 ng/L)



Method Performance Summary January - December 1992

Analyte	N-nitrosodimethylamine
True Concentration	0.010 4 µg/L
Number of Observations	36
Between-run Standard Deviation	10%
Accuracy (% of expected)	114%

METHOD CODE : PAAFD-E3122A
METHOD TITLE: The Determination of Polychlorinated Dibenzo-p-dioxins (PCDD) and Polychlorinated Dibenzofurans (PCDF) in Ambient Air

LABORATORY : Dioxin Unit
SUPERVISOR : Dr. E. Reiner

SAMPLE TYPE : ambient air

PRINCIPLE OF THE METHOD :

Samples are collected using a MOE-modified high-volume air sampler with a polyurethane foam (PUF) plug and Teflon-coated glass fibre filter. A known quantity of isotopically labelled PCDDs and PCDFs is added to each sample to serve as an internal quantitation standard. PCDDs and PCDFs are extracted from the PUF and filter using a Soxhlet extraction apparatus and toluene. The concentrated extract is processed through a multi-stage chromatographic cleanup procedure to remove potential chemical interferences. After cleanup, the extract is evaporated to dryness.

The reconstituted extract is analyzed by gas chromatography - tandem mass spectrometry (GC-MS-MS) or gas chromatography - high resolution mass spectrometry (GC-HRMS).

Further cleanup using high performance liquid chromatography (HPLC) may be necessary prior to final analysis if the sample is highly contaminated with chemical interferences that are not removed by the open-column chromatographic cleanup.

PARAMETERS MEASURED :	**IDL (pg/m^3)**	**MDL (pg/m^3)**
2,3,7,8-tetrachlorodibenzo-p-dioxin	0.001	0.005
1,2,3,7,8-pentachlorodibenzo-p-dioxin	0.001	0.02
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	0.002	0.02
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	0.002	0.02
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	0.002	0.02
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	0.003	0.02
octachlorodibenzo-p-dioxin	0.005	0.06
2,3,7,8-tetrachlorodibenzofuran	0.001	0.007
2,3,4,7,8-pentachlorodibenzofuran	0.001	0.02
1,2,3,7,8-pentachlorodibenzofuran	0.001	0.02
1,2,3,4,7,8-hexachlorodibenzofuran	0.002	0.02
1,2,3,6,7,8-hexachlorodibenzofuran	0.002	0.01
2,3,4,6,7,8-hexachlorodibenzofuran	0.002	0.02
1,2,3,7,8,9-hexachlorodibenzofuran	0.002	0.02
1,2,3,4,6,7,8-heptachlorodibenzofuran	0.003	0.04
1,2,3,4,7,8,9-heptachlorodibenzofuran	0.003	0.03
octachlorodibenzofuran	0.005	0.07

(parameters measured continued)

total tetrachlorinated dibenzo-p-dioxins (TCDD)
total pentachlorinated dibenzo-p-dioxins (PCDD)
total hexachlorinated dibenzo-p-dioxins (HxCDD)
total heptachlorinated dibenzo-p-dioxins (HpCDD)
total tetrachlorinated dibenzofurans (TCDF)
total pentachlorinated dibenzofurans (PCDF)
total hexachlorinated dibenzofurans (HxCDF)
total heptachlorinated dibenzofurans (HpCDF)

REPORTING FORMAT :

Results are reported as pg/m^3 rounded off to 2 significant figures. The minimum reported levels are sample and analyte specific * and range from 0.001 pg/m^3 to 0.01 pg/m^3.

QUALITY CONTROL :

The routine quality control operations monitor overall method performance (precision and recovery samples), validity of calibration and consistency in injection volume (injection standard), absence of potential contamination (method blanks) and recovery of target analytes (internal quantitation standard).

REMARKS : Two types of performance limits are displayed on the performance charts. One set was statistically derived from the 1992 data; while the other (established at recoveries of 70% and 130%) was adopted by the Dioxin Unit as method performance control limits.

List of Performance Charts and Tables:

Method Blanks Summary
2,3,7,8-tetrachlorodibenzo-p-dioxin
1,2,3,7,8-pentachlorodibenzo-p-dioxin
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin
octachlorodibenzo-p-dioxin
2,3,7,8-tetrachlorodibenzofuran
2,3,4,7,8-pentachlorodibenzofuran
1,2,3,7,8-pentachlorodibenzofuran
1,2,3,4,7,8-hexachlorodibenzofuran

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* The minimum reported levels correspond to the amount of analyte that would give most-abundant ion response five times higher than corresponding instrumental noise.

(List of Performance Charts and Tables)

1,2,3,6,7,8-hexachlorodibenzofuran
2,3,4,6,7,8-hexachlorodibenzofuran
1,2,3,7,8,9-hexachlorodibenzofuran
1,2,3,4,6,7,8-heptachlorodibenzofuran
1,2,3,4,7,8,9-heptachlorodibenzofuran
octachlorodibenzofuran

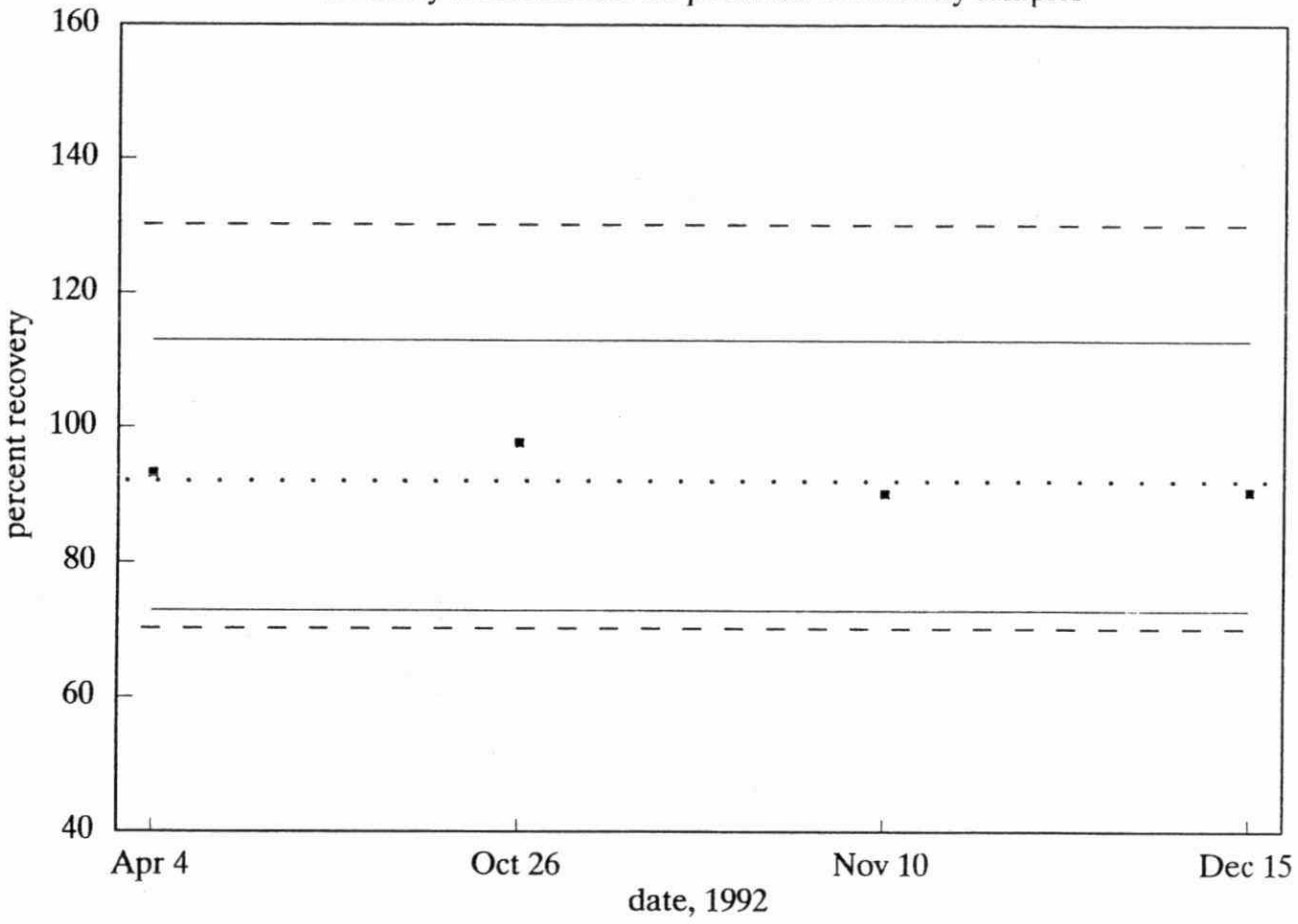
Method Blanks Summary January 1992 - December 1992

Analyte	Number of Observations	Average Concentration ($x10^{-3}$ pg/m^3)	Standard Deviation ($x10^{-3}$ pg/m^3)
2,3,7,8-tetrachlorodibenzo-p-dioxin	13	ND (1)	
1,2,3,7,8-pentachlorodibenzo-p-dioxin	13	0.23	0.80
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	13	ND (2)	
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	13	0.3	1.1
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	13	0.4	1.6
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	13	1.5	5.3
octachlorodibenzo-p-dioxin	13	6	14
2,3,7,8-tetrachlorodibenzofuran	13	2.9	9.8
2,3,4,7,8-pentachlorodibenzofuran	13	0.5	1.6
1,2,3,7,8-pentachlorodibenzofuran	13	0.8	2.7
1,2,3,4,7,8-hexachlorodibenzofuran	13	1.2	4.7
1,2,3,6,7,8-hexachlorodibenzofuran	13	0.5	1.6
2,3,4,6,7,8-hexachlorodibenzofuran	13	0.8	2.4
1,2,3,7,8,9-hexachlorodibenzofuran	13	ND (2)	
1,2,3,4,6,7,8-heptachlorodibenzofuran	13	1.9	4.6
1,2,3,4,7,8,9-heptachlorodibenzofuran	13	ND (3)	
octachlorodibenzofuran	13	0.9	2.9

ND ... Not detected. Detection limit in fg/m^3 given in brackets ( ).

2,3,7,8–tetrachlorodibenzo–p–dioxin

recovery from ambient air precision & recovery samples



. . . . . average recovery (% of expected)
——— 99% confidence limits
– – – – – control limits

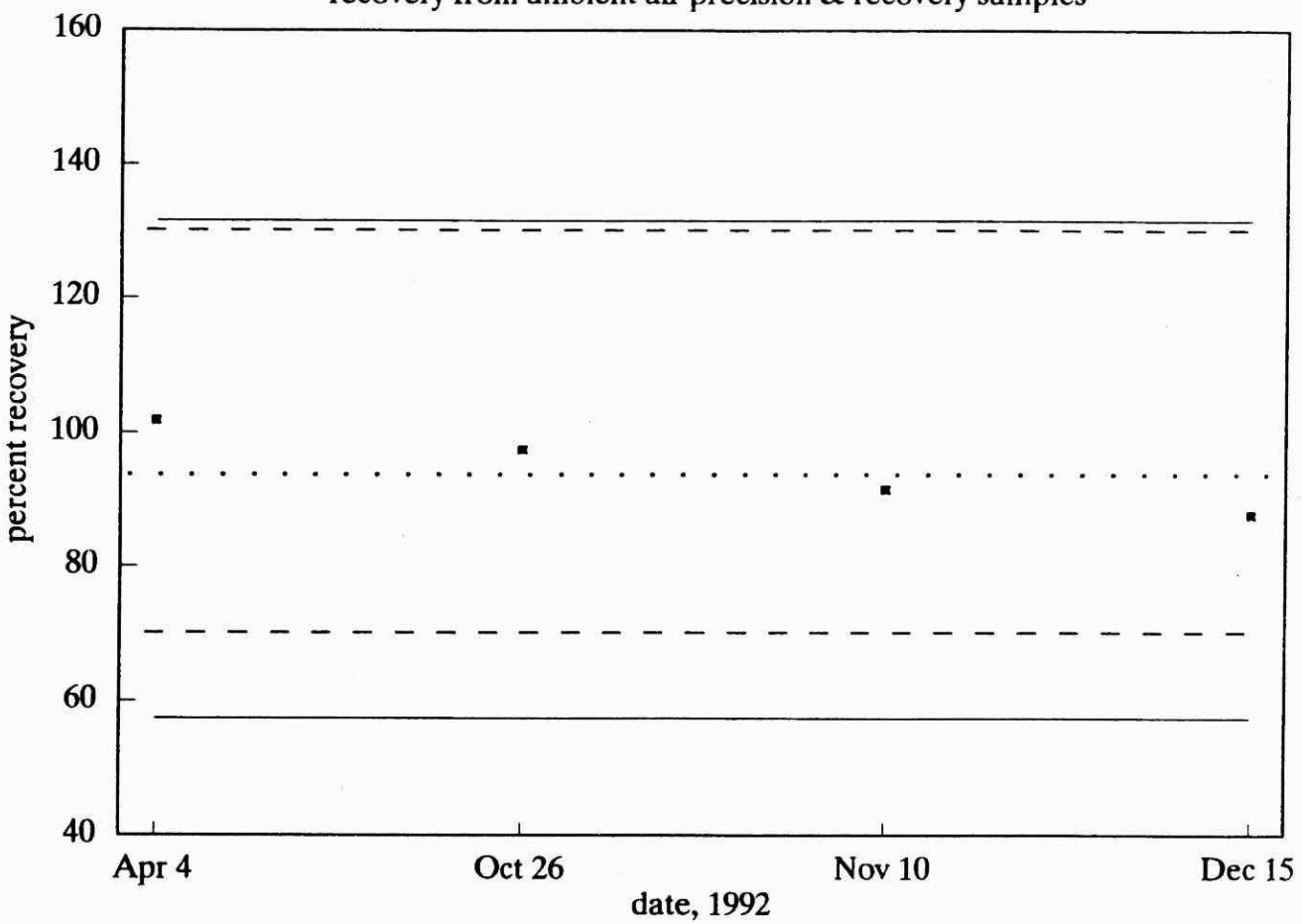
Performance Summary Table — January - December 1992

Analyte	2,3,7,8-tetrachlorodibenzo-p-dioxin
True Concentration	0.27 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	3.4 %
Accuracy (% of expected)	92.9 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

1,2,3,7,8–pentachlorodibenzo–p–dioxin

recovery from ambient air precision & recovery samples



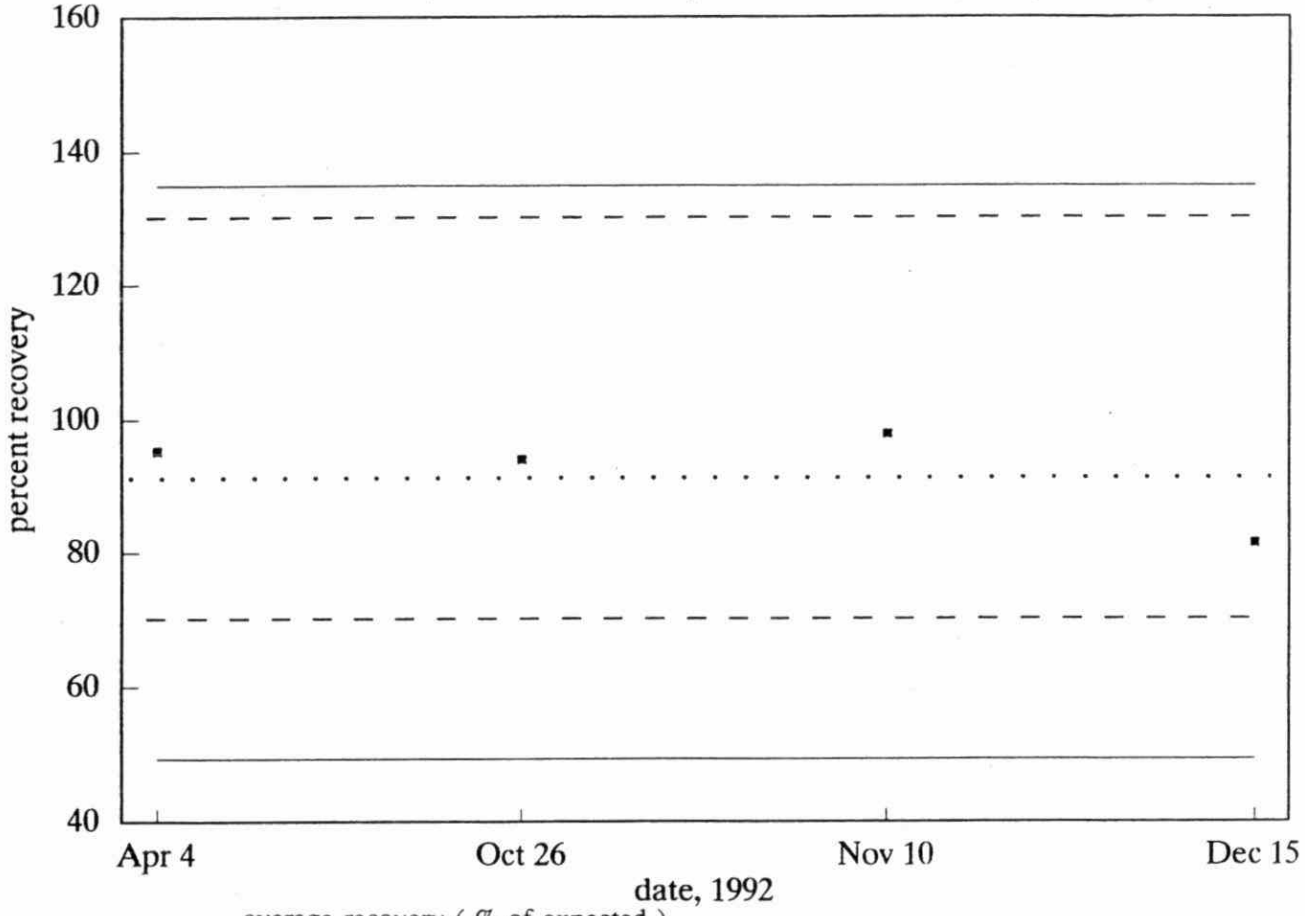
Performance Summary Table — January - December 1992

Analyte	1,2,3,7,8-pentachlorodibenzo-p-dioxin
True Concentration	1.3 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	6.4 %
Accuracy (% of expected)	94.5 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

1,2,3,4,7,8–hexachlorodibenzo–p–dioxin

recovery from ambient air precision & recovery samples



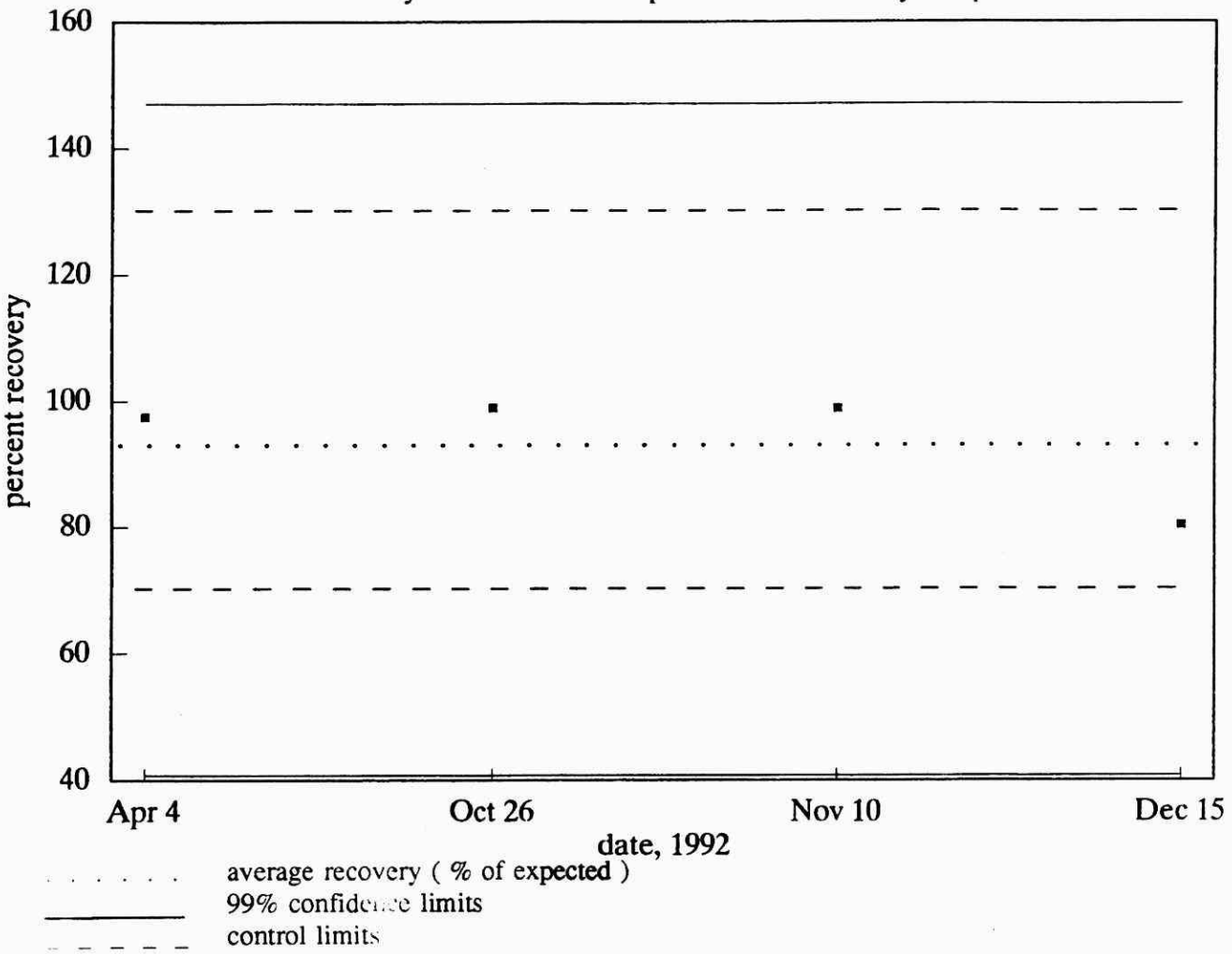
Performance Summary Table — January - December 1992

Analyte	1,2,3,4,7,8-hexachlorodibenzo-p-dioxin
True Concentration	1.3 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	7 %
Accuracy (% of expected)	92 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

1,2,3,6,7,8–hexachlorodibenzo–p–dioxin

recovery from ambient air precision & recovery samples



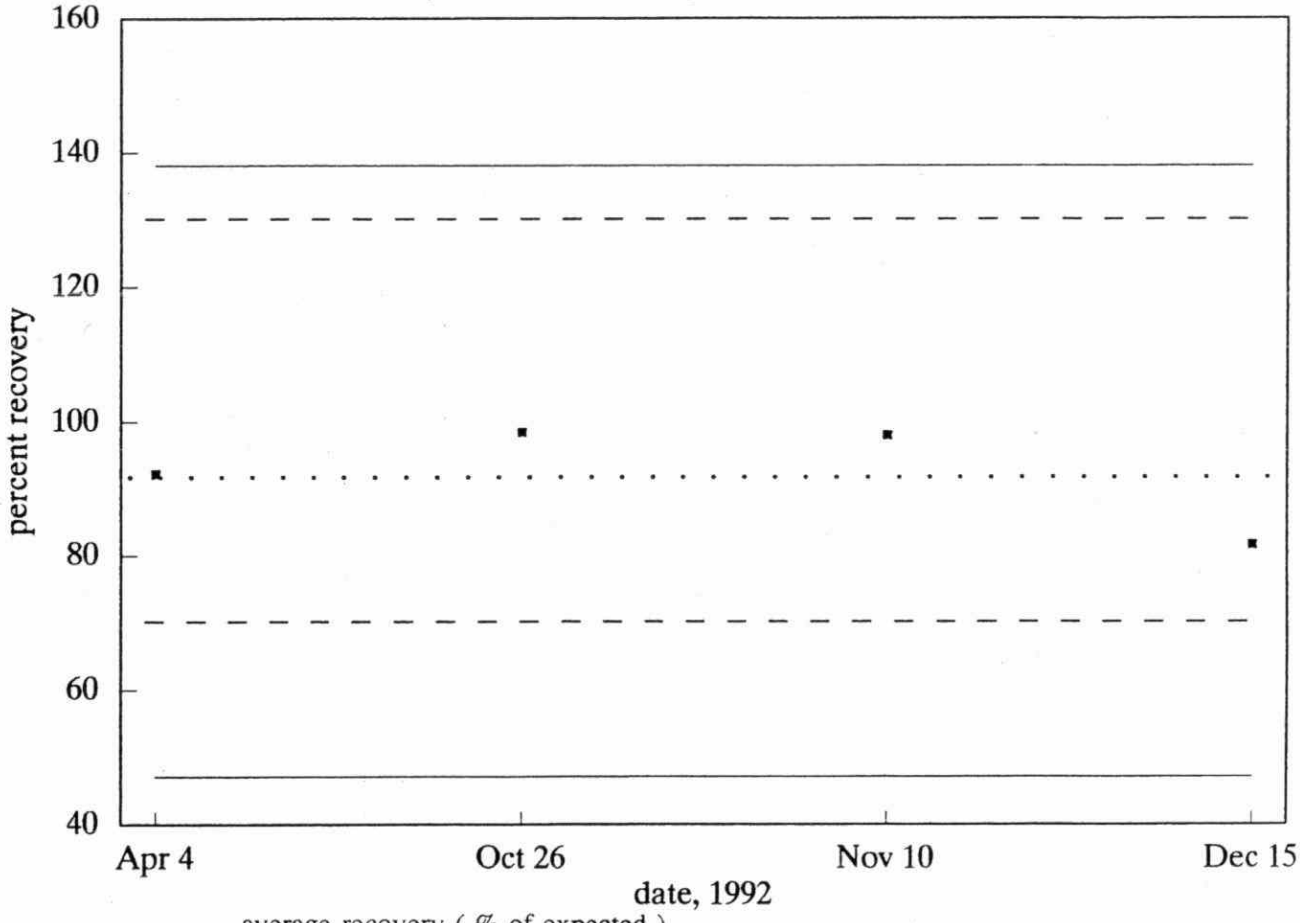
Performance Summary Table — January - December 1992

Analyte	1,2,3,6,7,8-hexachlorodibenzo-p-dioxin
True Concentration	1.3 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	9 %
Accuracy (% of expected)	94 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

1,2,3,7,8,9–hexachlorodibenzo–p–dioxin

recovery from ambient air precision & recovery samples



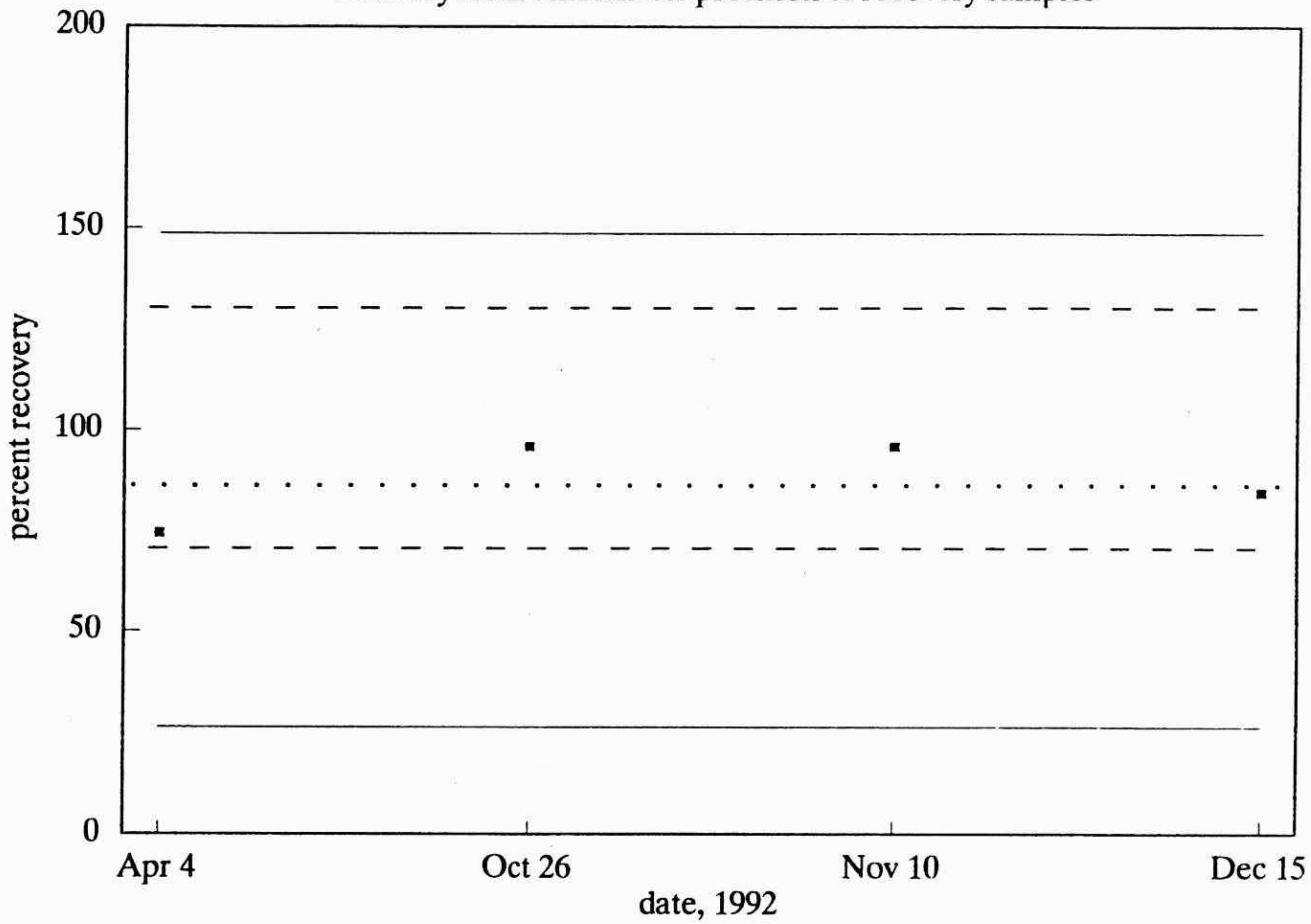
Performance Summary Table — January - December 1992

Analyte	1,2,3,7,8,9-hexachlorodibenzo-p-dioxin
True Concentration	1.3 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	8 %
Accuracy (% of expected)	93 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

1,2,3,4,6,7,8–heptachlorodibenzo–p–dioxin

recovery from ambient air precision & recovery samples



. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

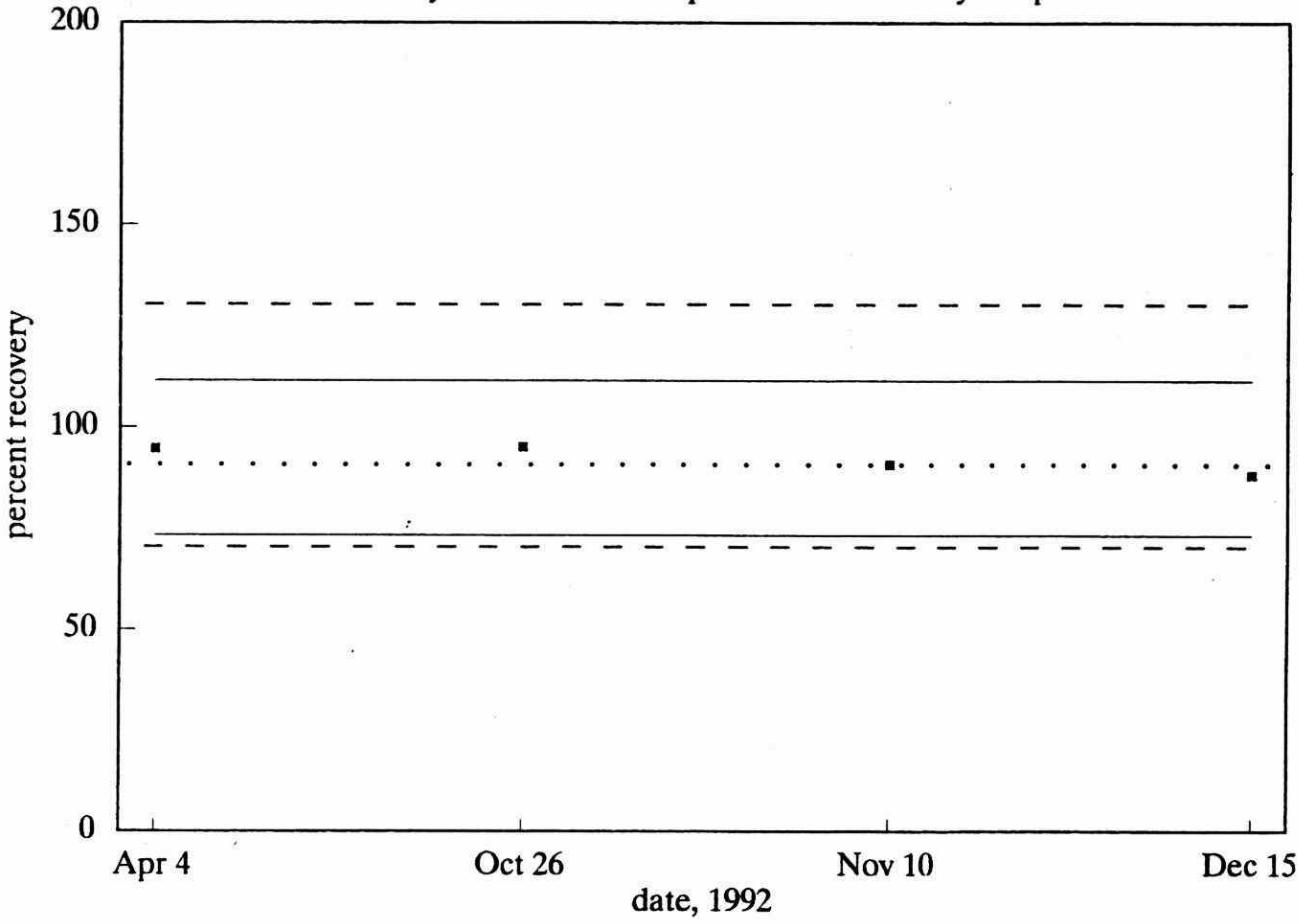
Performance Summary Table — January - December 1992

Analyte	1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin
True Concentration	1.3 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	11 %
Accuracy (% of expected)	88 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

octachlorodibenzo–p–dioxin

recovery from ambient air precision & recovery samples



. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

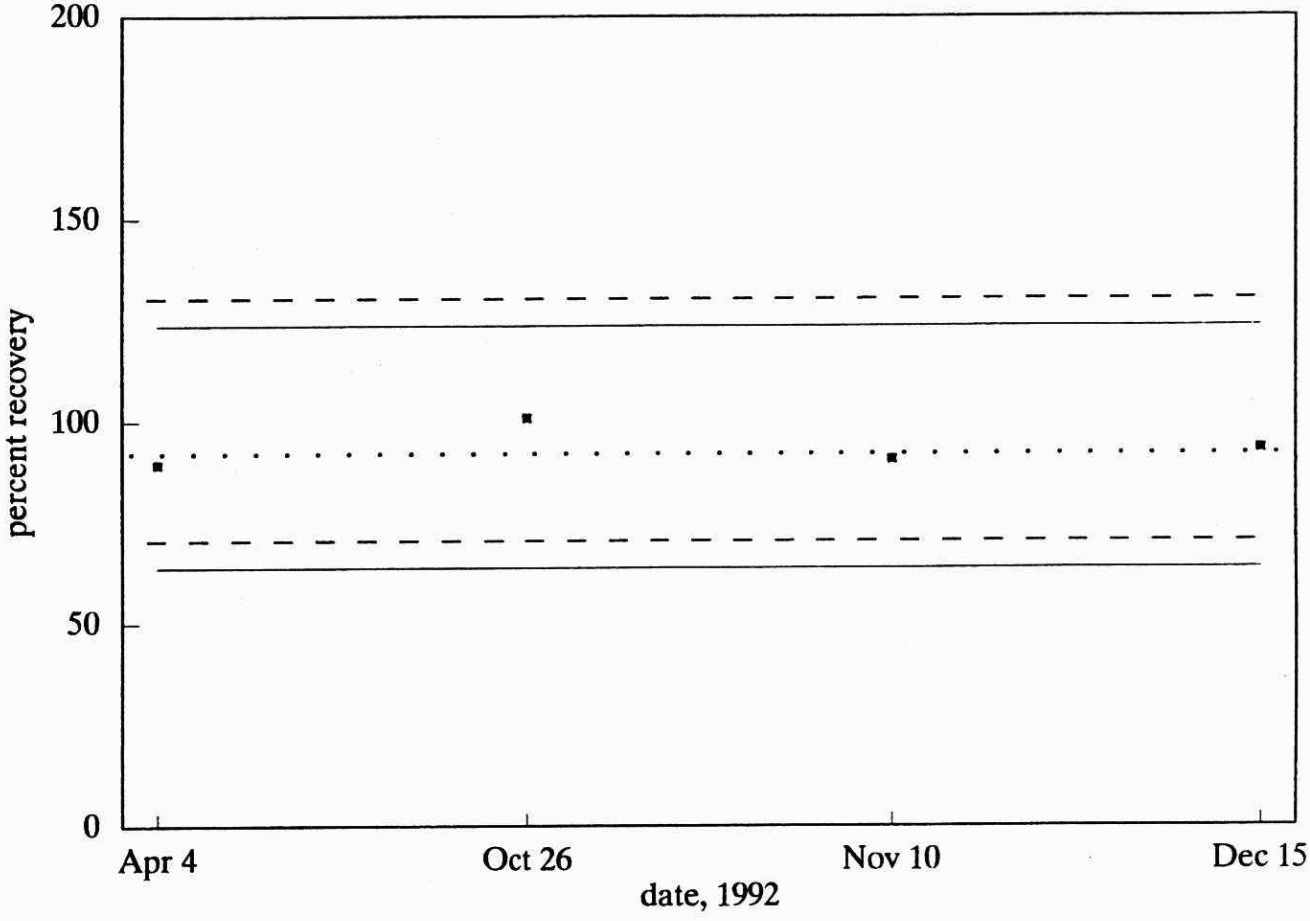
Performance Summary Table January - December 1992

Analyte	octachlorodibenzo-p-dioxin
True Concentration	2.7 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	3.3 %
Accuracy (% of expected)	92.3 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

2,3,7,8–tetrachlorodibenzofuran

recovery from ambient air precision & recovery samples



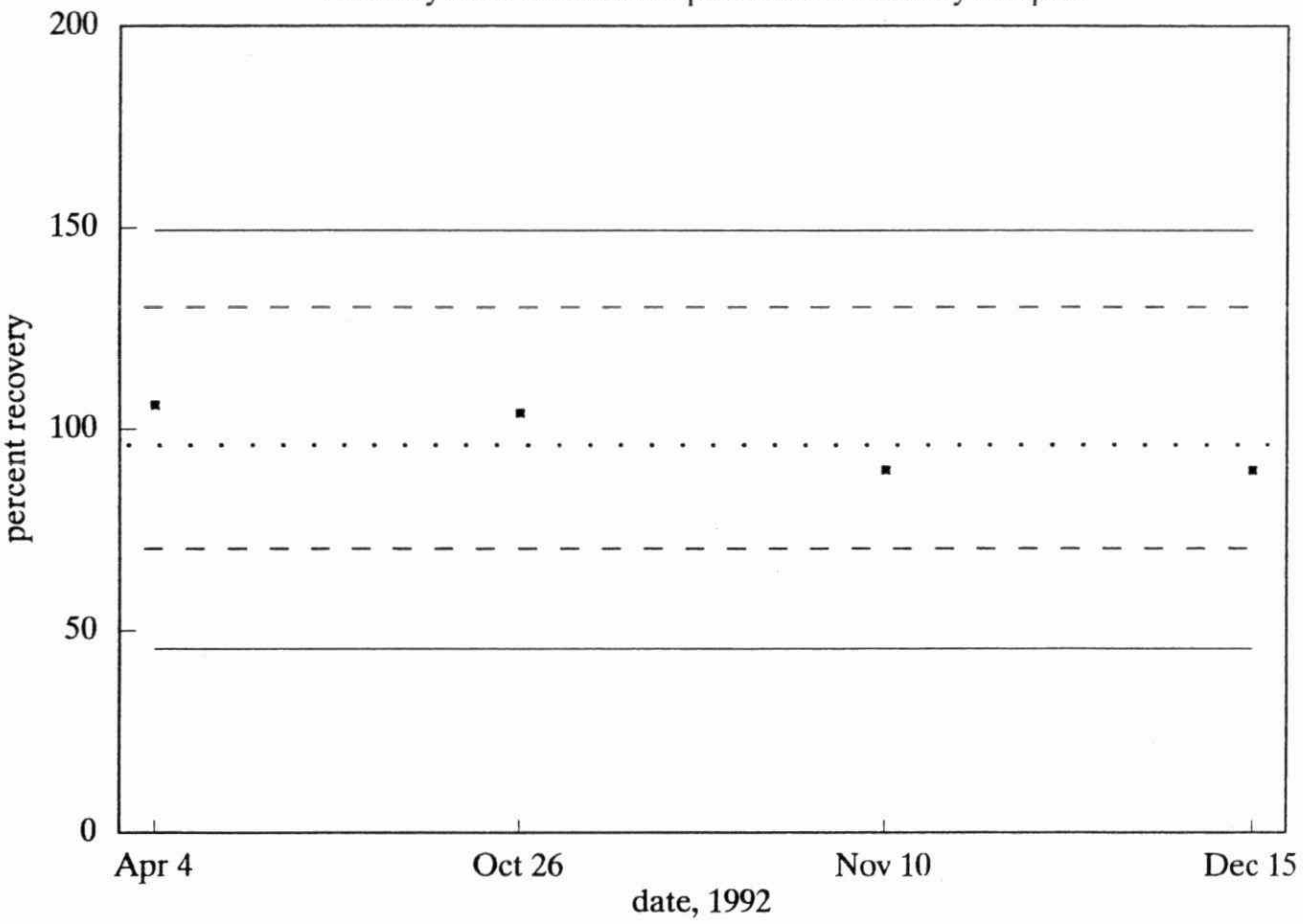
Performance Summary Table — January - December 1992

Analyte	2,3,7,8-tetrachlorodibenzofuran
True Concentration	0.27 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	5 %
Accuracy (% of expected)	94 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

2,3,4,7,8–pentachlorodibenzofuran

recovery from ambient air precision & recovery samples



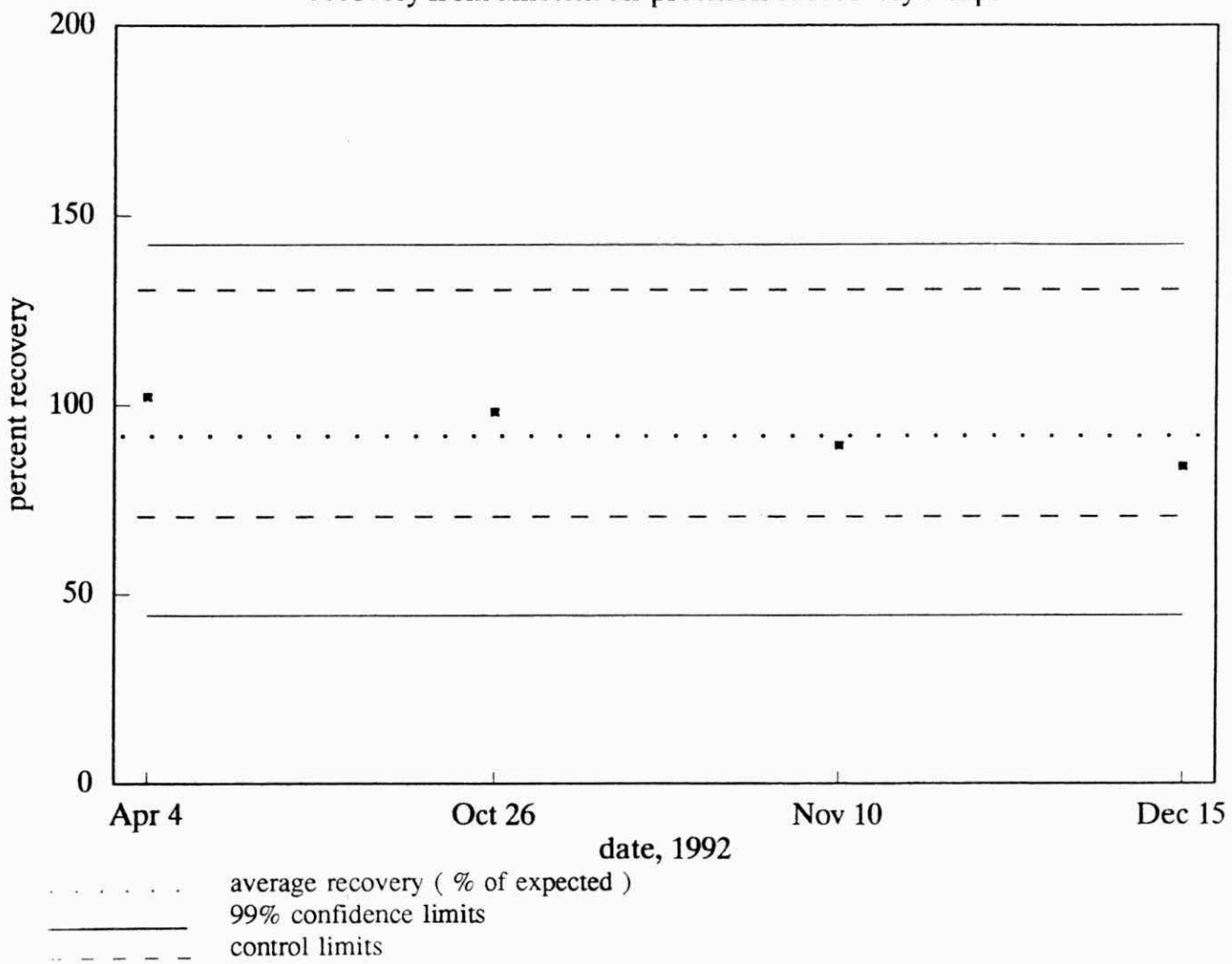
Performance Summary Table — January - December 1992

Analyte	2,3,4,7,8-pentachlorodibenzofuran
True Concentration	1.3 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	9 %
Accuracy (% of expected)	97 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

1,2,3,7,8–pentachlorodibenzofuran

recovery from ambient air precision & recovery samples



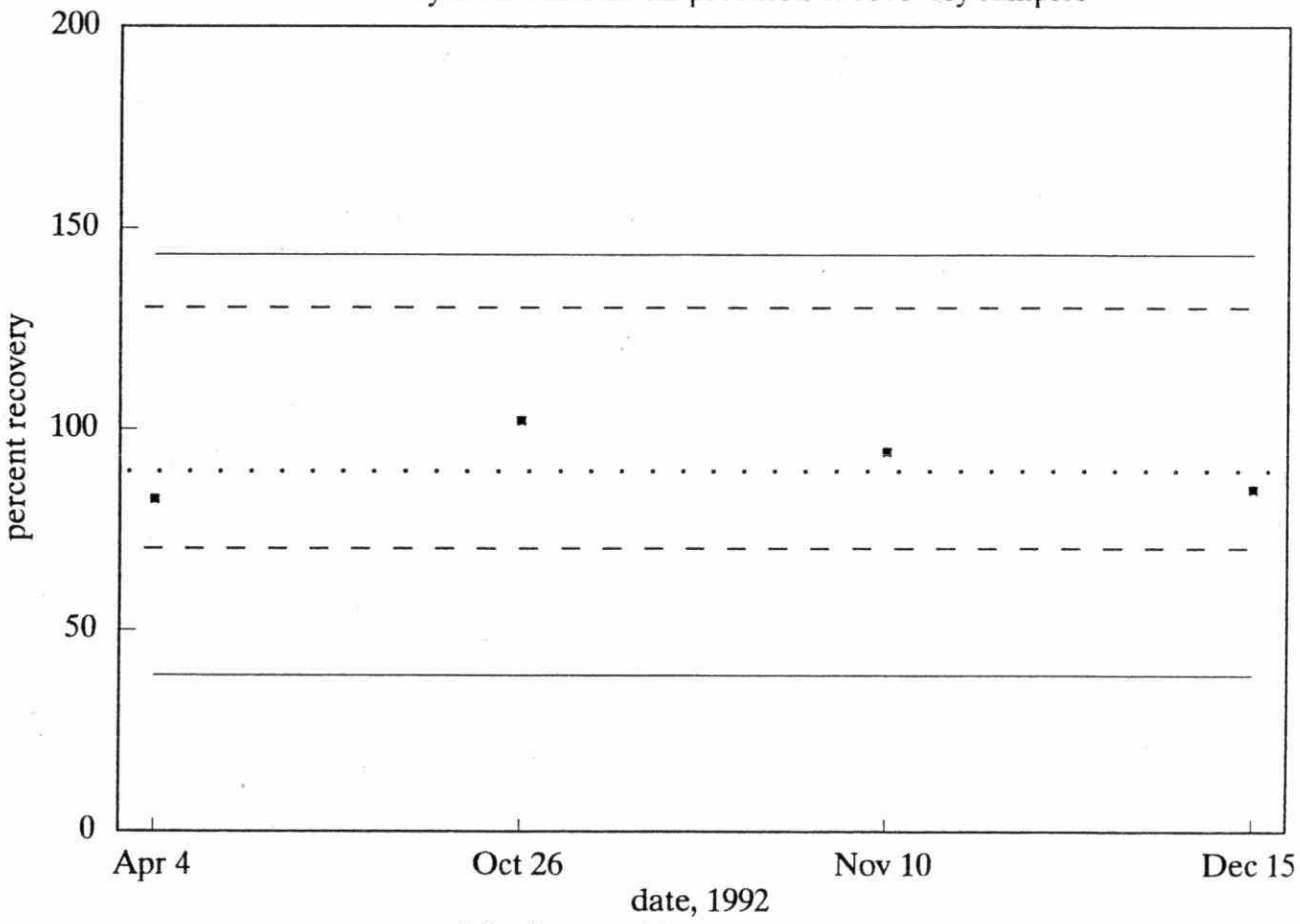
Performance Summary Table January - December 1992

Analyte	1,2,3,7,8-pentachorodibenzofuran
True Concentration	1.3 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	8 %
Accuracy (% of expected)	93 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

1,2,3,4,7,8–hexachlorodibenzofuran

recovery from ambient air precision & recovery samples



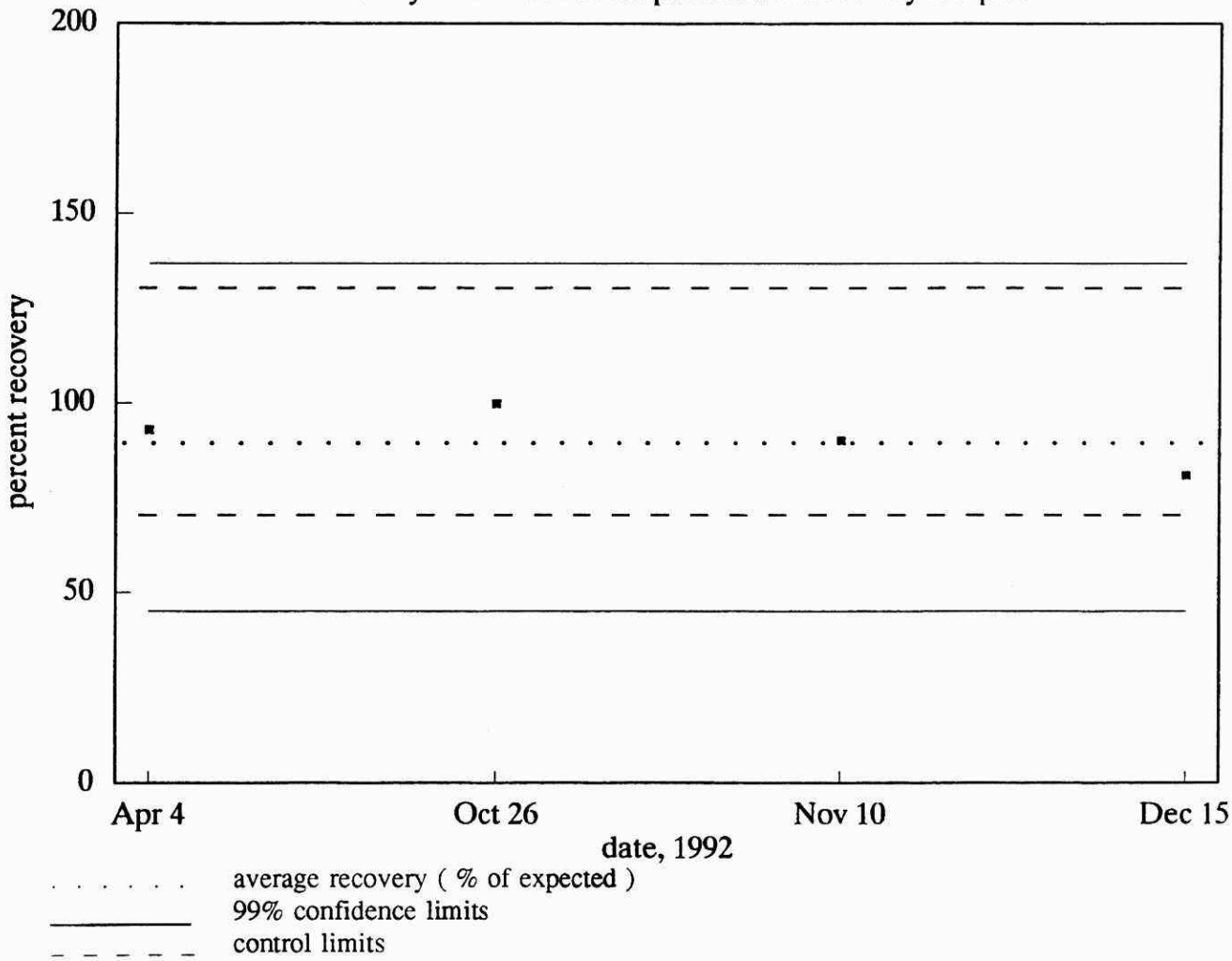
Performance Summary Table — January - December 1992

Analyte	1,2,3,4,7,8-hexachlorodibenzofuran
True Concentration	1.3 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	9 %
Accuracy (% of expected)	91 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

1,2,3,6,7,8–hexachlorodibenzofuran

recovery from ambient air precision & recovery samples



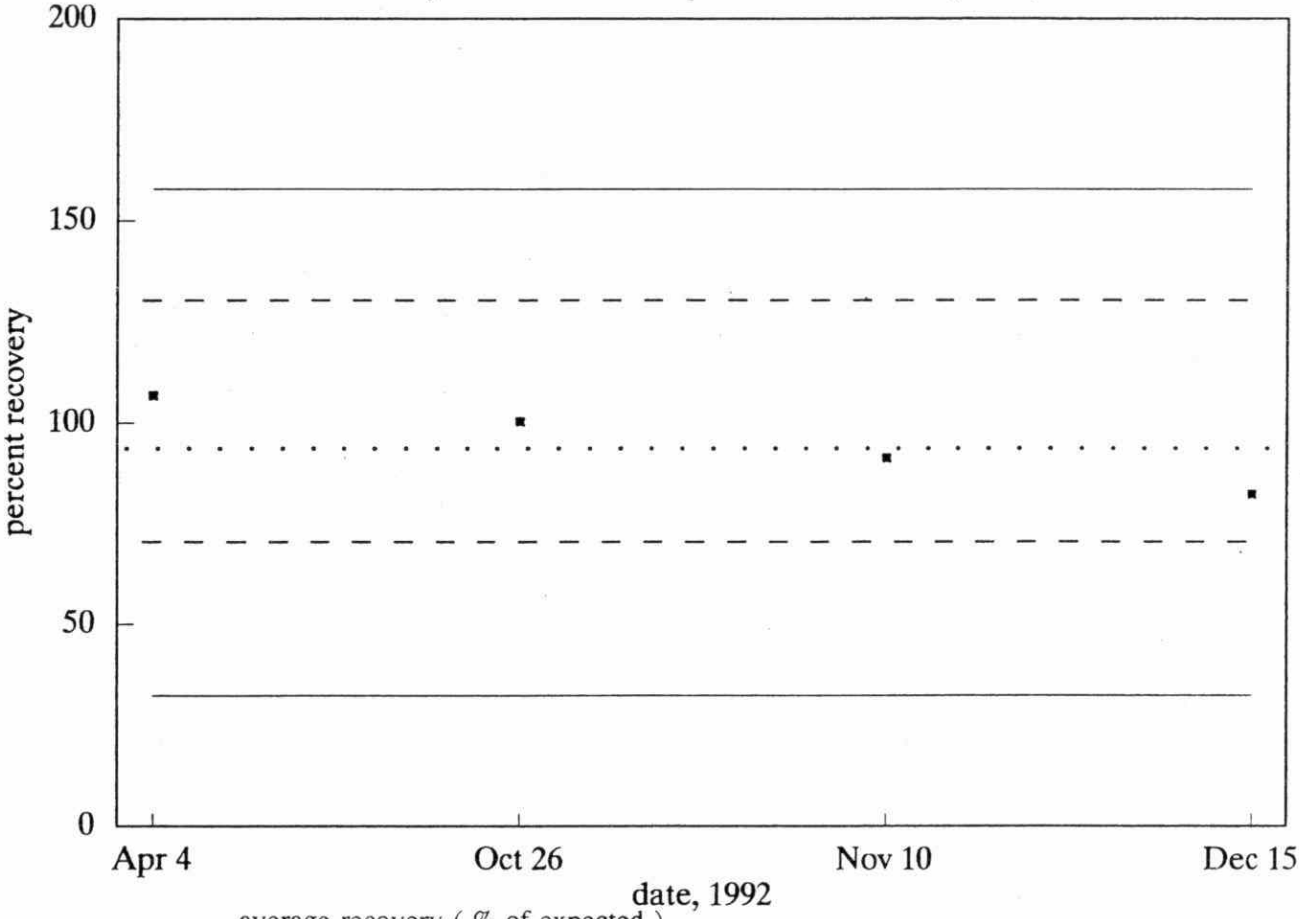
Performance Summary Table — January - December 1992

Analyte	1,2,3,6,7,8-hexachlorodibenzofuran
True Concentration	1.3 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	8 %
Accuracy (% of expected)	91 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

2,3,4,6,7,8–hexachlorodibenzofuran

recovery from ambient air precision & recovery samples



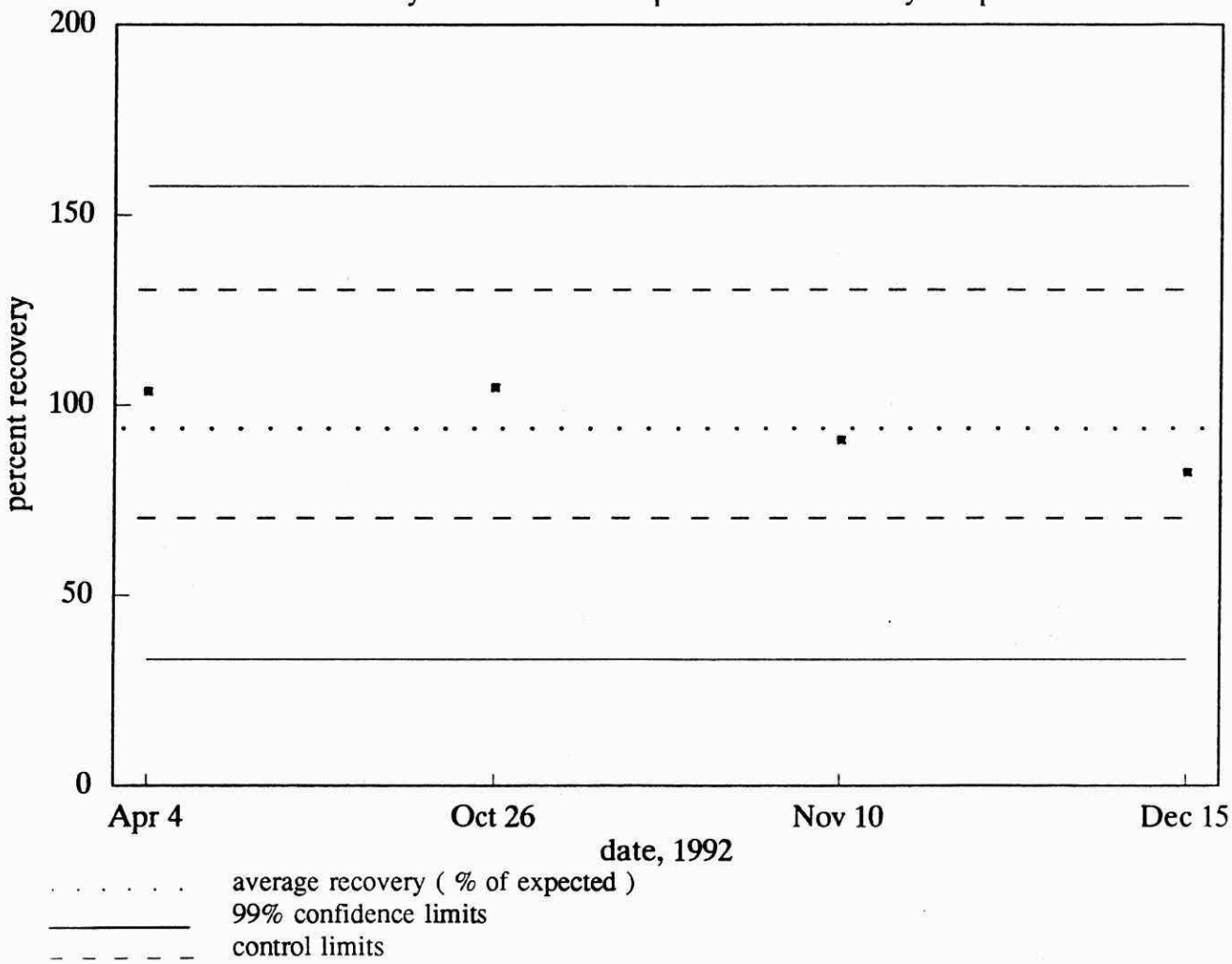
Performance Summary Table — January - December 1992

Analyte	2,3,4,6,7,8-hexachlorodibenzofuran
True Concentration	1.3 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	11 %
Accuracy (% of expected)	95 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

1,2,3,7,8,9–hexachlorodibenzofuran

recovery from ambient air precision & recovery samples



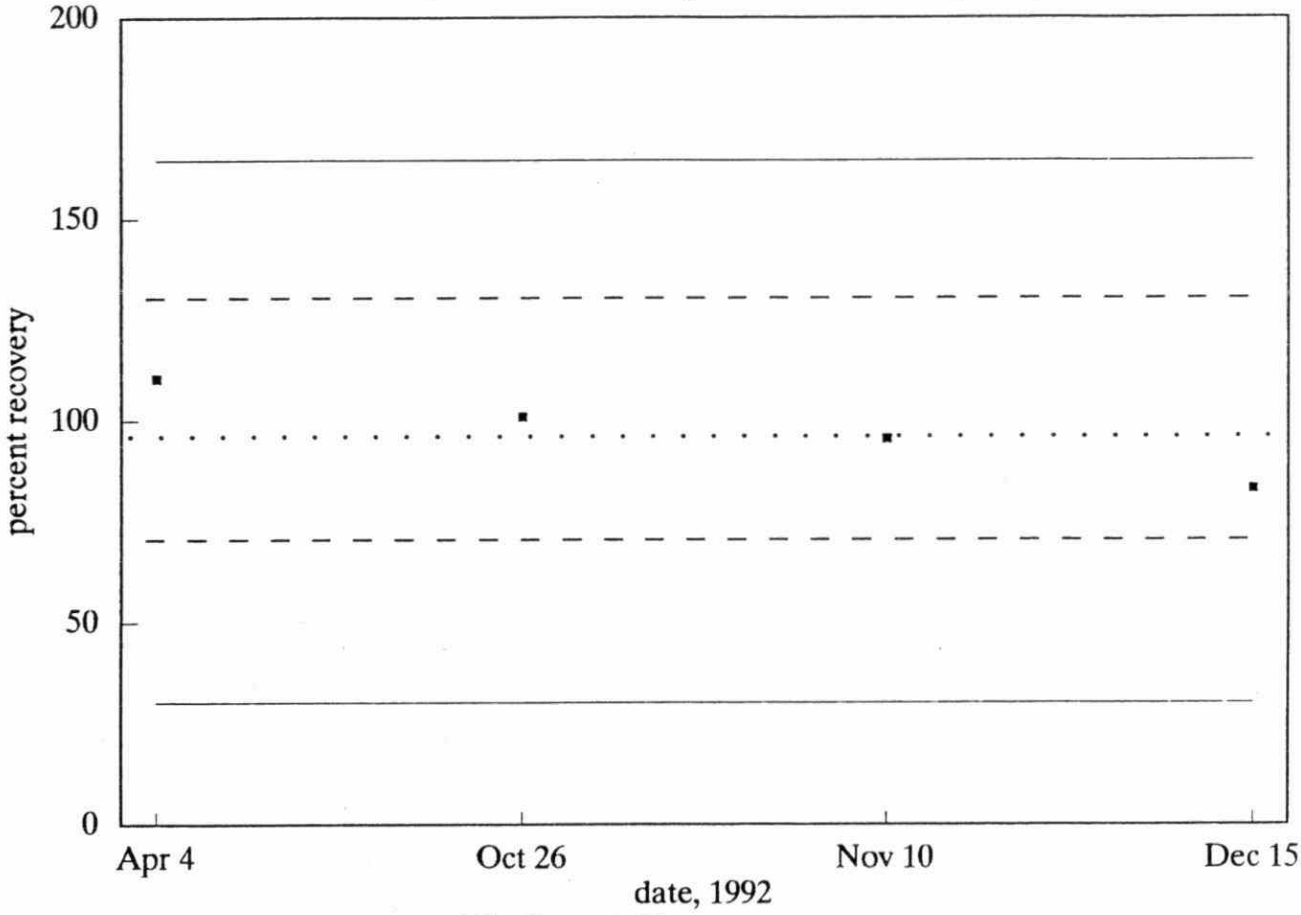
Performance Summary Table — January - December 1992

Analyte	1,2,3,7,8,9-hexachlorodibenzofuran
True Concentration	1.3 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	11 %
Accuracy (% of expected)	95 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

1,2,3,4,6,7,8–heptachlorodibenzofuran

recovery from ambient air precision & recovery samples



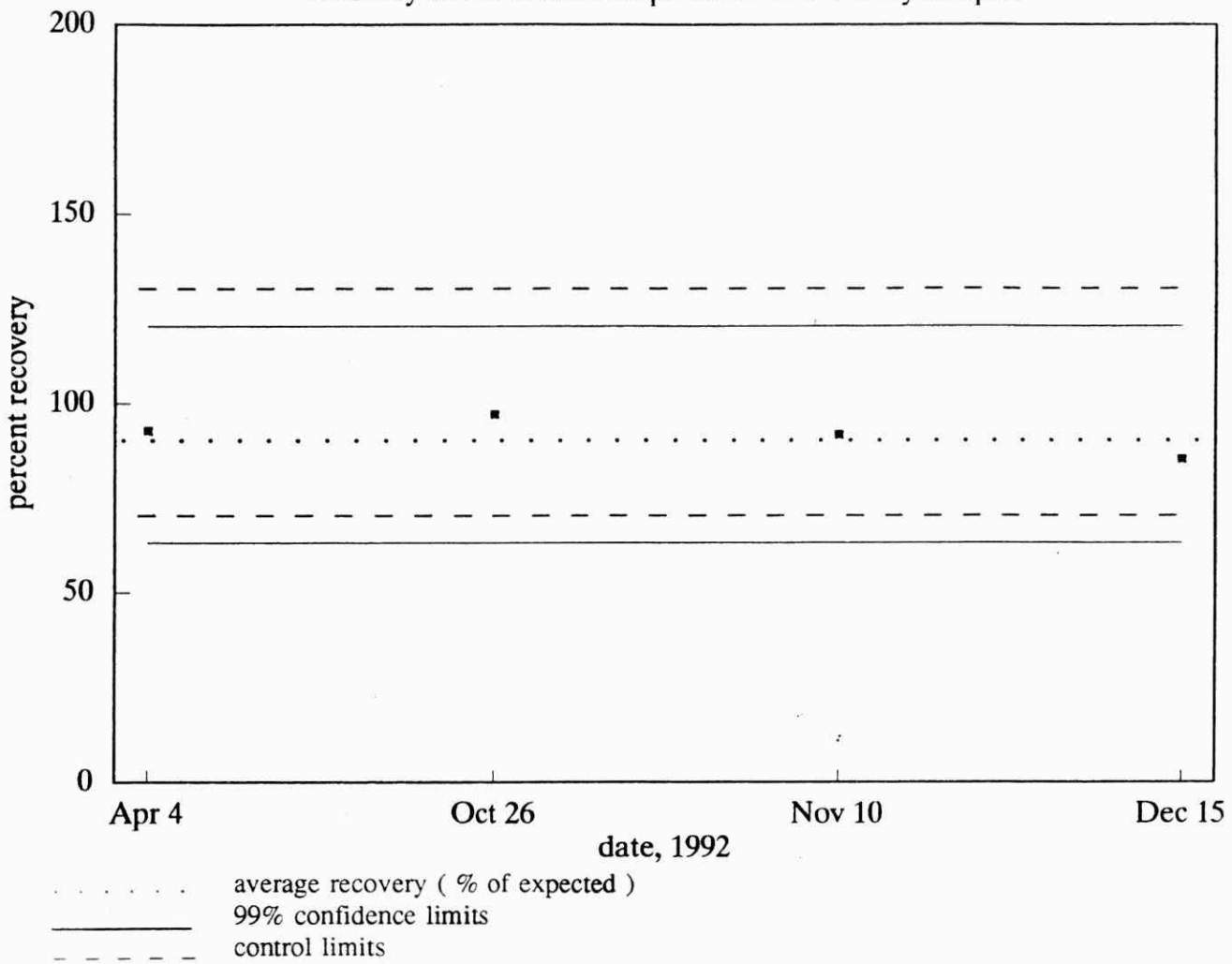
Performance Summary Table — January - December 1992

Analyte	1,2,3,4,6,7,8-heptachlorodibenzofuran
True Concentration	1.3 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	12 %
Accuracy (% of expected)	97 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

1,2,3,4,7,8,9–heptachlorodibenzofuran

recovery from ambient air precision & recovery samples



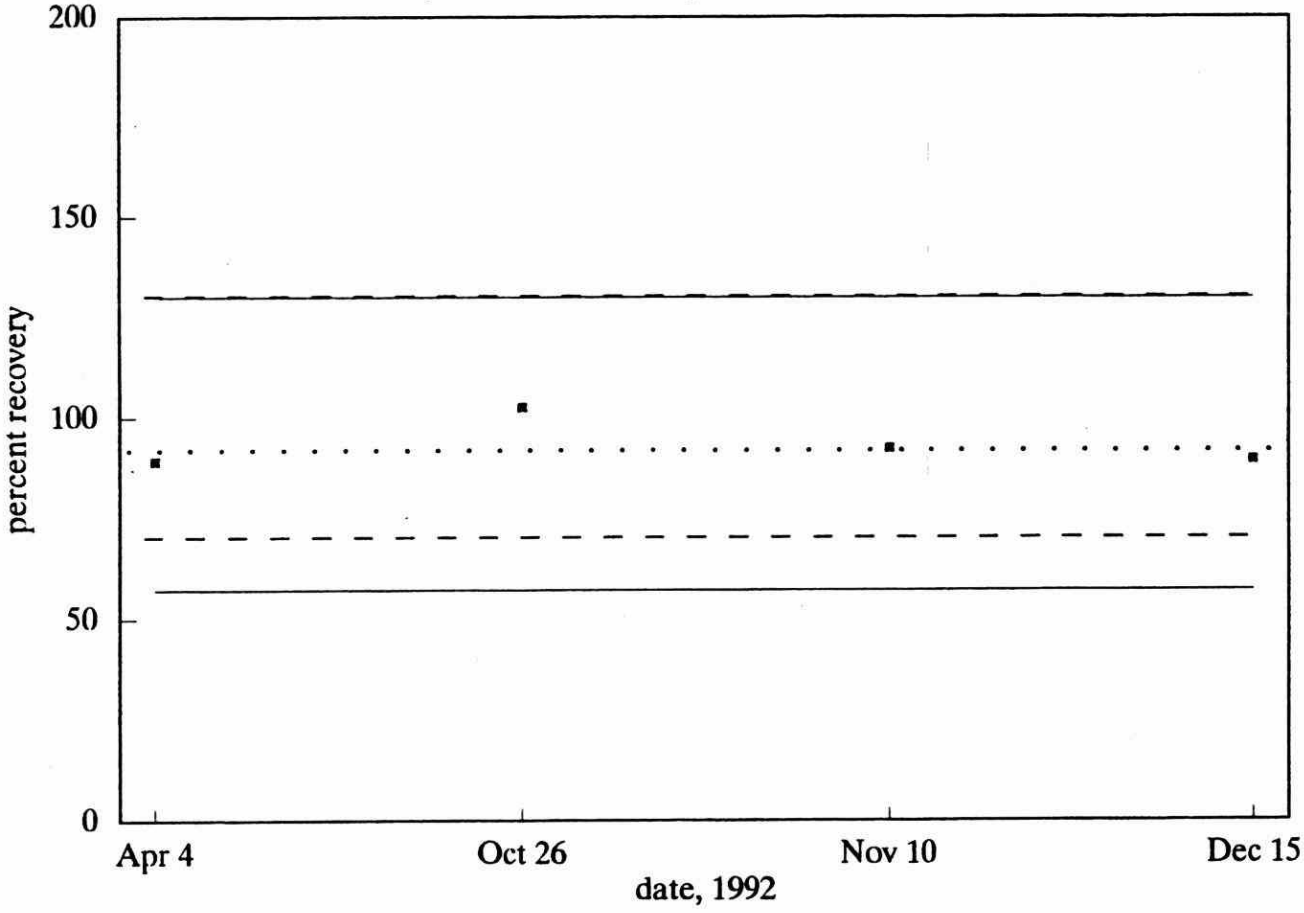
Performance Summary Table — January - December 1992

Analyte	1,2,3,4,7,8,9-heptachlorodibenzofuran
True Concentration	1.3 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	5 %
Accuracy (% of expected)	92 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

octachlorodibenzofuran

recovery from ambient air precision & recovery samples



. . . . . average recovery (% of expected)
_____ 99% confidence limits
- - - - - control limits

Performance Summary Table January - December 1992

Analyte	octachlorodibenzofuran
True Concentration	2.7 pg/m^3 *
Number of Observations	4
Between-run Standard Deviation	6 %
Accuracy (% of expected)	94 %

* true concentration relates to the original sample volume of 3 000 m^3; see official text of the method for the details on spiking procedure

METHOD CODE : PAAFD-E3318A
METHOD TITLE: The Determination of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans in Precipitation by GC-MS

LABORATORY : Dioxin Unit
SUPERVISOR : Dr. E. Reiner

SAMPLE TYPE : precipitation (aqueous samples containing less than 10% solids)

PRINCIPLE OF THE METHOD :

Samples consist of the separate portions: a cartridge containing XAD-2 Amberlite resin, a glass fibre filter and solvent used to rinse the collection funnel. A known quantity of isotopically labelled PCDDs and PCDFs is added to each sample to serve as an internal quantitation standard. The filter is solid/liquid extracted using a Soxhlet extractor and the XAD-2 resin is eluted with acetone/hexane. A multi-stage chromatographic cleanup procedure is used to remove potential chemical interferences.

The reconstituted final extract is examined by gas chromatography - high resolution mass spectrometry (GC-HRMS) or gas chromatography/tandem mass spectrometry (GC-MS-MS).

PARAMETERS MEASURED :	**IDL (pg)**
2,3,7,8-tetrachlorodibenzo-p-dioxin	5
1,2,3,7,8-pentachlorodibenzo-p-dioxin	5
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	10
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	10
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	10
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	15
octachlorodibenzo-p-dioxin	20
2,3,7,8-tetrachlorodibenzofuran	5
2,3,4,7,8-pentachlorodibenzofuran	5
1,2,3,7,8-pentachlorodibenzofuran	5
1,2,3,4,7,8-hexachlorodibenzofuran	10
1,2,3,6,7,8-hexachlorodibenzofuran	10
2,3,4,6,7,8-hexachlorodibenzofuran	10
1,2,3,7,8,9-hexachlorodibenzofuran	10
1,2,3,4,6,7,8-heptachlorodibenzofuran	15
1,2,3,4,7,8,9-heptachlorodibenzofuran	15
octachlorodibenzofuran	20

total tetrachlorinated dibenzo-p-dioxins (TCDD)
total pentachlorinated dibenzo-p-dioxins (PCDD)
total hexachlorinated dibenzo-p-dioxins (HxCDD)
total heptachlorinated dibenzo-p-dioxins (HpCDD)
total tetrachlorinated dibenzofurans (TCDF)

(Parameters Measured continued)

total pentachlorinated dibenzofurans (PCDF)
total hexachlorinated dibenzofurans (HxCDF)
total heptachlorinated dibenzofurans (HpCDF)

REPORTING FORMAT :

Results are reported in total picograms (pg) rounded off to 2 significant figures. The minimum reported levels are sample and analyte specific * and range from 5 pg to 20 pg.

QUALITY CONTROL :

The routine quality control operations monitor overall method performance (precision and recovery samples), validity of calibration and consistency in injection volume (injection standard), absence of potential contamination (method blanks) and recovery of target analytes (internal quantitation standard).

List of Performance Tables : Method Blanks Summary

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* The minimum reported levels correspond to the amount of analyte that would give most-abundant ion response five times higher than corresponding instrumental noise.

Method Blanks Summary
Precipitation - Filters

January 1992 - December 1992

Analyte	Number of Observations	Average Weight (pg)	Standard Deviation (pg)
2,3,7,8-tetrachlorodibenzo-p-dioxin	6	ND (5)	
1,2,3,7,8-pentachlorodibenzo-p-dioxin	6	ND (5)	
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	6	ND (10)	
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	6	ND (10)	
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	6	ND (10)	
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	6	ND (15)	
octachlorodibenzo-p-dioxin	6	2.7	6.0
2,3,7,8-tetrachlorodibenzofuran	6	ND (5)	
2,3,4,7,8-pentachlorodibenzofuran	6	ND (5)	
1,2,3,7,8-pentachlorodibenzofuran	6	ND (5)	
1,2,3,4,7,8-hexachlorodibenzofuran	6	ND (10)	
1,2,3,6,7,8-hexachlorodibenzofuran	6	ND (10)	
2,3,4,6,7,8-hexachlorodibenzofuran	6	ND (10)	
1,2,3,7,8,9-hexachlorodibenzofuran	6	ND (10)	
1,2,3,4,6,7,8-heptachlorodibenzofuran	6	ND (15)	
1,2,3,4,7,8,9-heptachlorodibenzofuran	6	ND (15)	
octachlorodibenzofuran	6	ND (20)	

ND ... Not detected. Detection limit in pg given in brackets ( ).

Ontario

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Laboratory Services Branch | Direction des services de laboratoire

Mailing Address
125 Resources Road
P.O. Box 213
Rexdale, Ontario
M9W 5L1

Adresse postale
125, chemin resources
C.P. 213
Rexdale (Ontario)
M9W 5L1

MEMORANDUM

DATE: August 16, 1993

TO: Distribution List

FROM: S. Villard
Manager, Drinking Water Analyses Section

RE: DWO Section 1992 Performance Report

Enclosed please find a copy of the Drinking Water Organics Section 1992 Performance Report. This report summarizes the quality control procedures and the performance of the analytical methods used in the laboratories of the former Drinking Water Organics Section.

The Section has been renamed the Drinking Water Analyses Section. The DWA Section Performance Report for 1993 is planned to include the performance of the tests carried out in the Plasma Spectrometry Trace Metals Unit.

I would like to thank Bill Berg, Patrick Crozier, Eva Duchoslav, Eric Reiner and Vince Taguchi for the effort they put into realizing this report.

S. Villard

S. Villard

enclosure

DISTRIBUTION LIST

Jim Merritt
Director, Central Region
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7 Overlea Blvd., 4th floor
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Thunder Bay, Ontario
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Toronto, Ontario
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Toronto, Ontario
M4V 1M2

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Manager, Drinking Water Section
Water Resources Branch
40 St.Clair Avenue West, 12th floor
Toronto, Ontario
M4V 1M2

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Water Resources Branch
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M4V 1M2

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40 St.Clair Avenue West, 10th floor
Toronto, Ontario
M4V 1M2

John Mayes
Manager, MISA/ Municipal Section
Water Resources Branch
40 St.Clair Avenue West, 9th floor
Toronto, Ontario
M4V 1M2

Steve E. Salbach
Senior Manager, MISA
Water Resources Branch
40 St.Clair Avenue West, 10th floor
Toronto, Ontario
M4V 1M2

Phyllis Miller
Manager, Watershed Management Section
Water Resources Branch
40 St.Clair Avenue West, 11th floor
Toronto, Ontario
M4V 1M2

Peter Dillon
Manager, Limnology
Water Resources Branch
Bellwood Acres Road
Dorset, Ontario
P0A1E0

Maris Lusis
Manager, Atmospheric Research and Special Programs, Air Resources Branch
125 Resources Road
Etobicoke, Ontario
M9P 3V6

Frank Reinholz
Manager, Abatement East
Central Region
7 Overlea Blvd., 7th floor
Toronto, Ontario
M4H 1A8

Paul Isles
Manager, Abatement West
Central Region
7 Overlea Blvd., 7th floor
Toronto, Ontario
M4H 1A8

Art Roy
Chief, Technical & Water Resources Assessment
Northeastern Region
199 Larch St., 11th floor
Sudbury, Ontario
P3E 5P9

Garth Mongrain
Supervisor, MISA & Systems
Northeastern Region
199 Larch St., 11th floor
Sudbury, Ontario
P3E 5P9

Gordon L. Van Fleet
Assistant Director
Northwestern Region, Thunder Bay Regional Office
P.O. Box 5000
435 James Street South, 3rd floor
Thunder Bay, Ontario
P7C 5G6

J. Luyt
Manager, Sarnia Area Office
Southwestern Region
265 Front Street North, Suite 109
Sarnia, Ontario
N7T 7X1

Albert E. Symmonds
Assistant Director/ Manager - Abatement
Southeastern Region
133 Dalton Avenue
Kingston, Ontario
K7K 6C2

Stan MacBeth
Chief, Kingston Laboratory
Southeastern Region
133 Dalton Avenue
Kingston, Ontario
K7K 6C2

W.G. Cook
Chief, Laboratory Services
Southwestern Region
985 Adelaide St. South
London, Ontario
N6E 1V3

James D. Stasiuk
Manager, Thunder Bay Laboratory
Northwestern Region
421 James St. South
Thunder Bay, Ontario
P3E 5P9

Bern Schnyder
Director, Laboratory Services Branch
125 Resources Road
Etobicoke, Ontario
M9P 3V6

George Kanert
Manager, Litigation and Waste Analyses Section
Laboratory Services Branch
125 Resources Road
Etobicoke, Ontario
M9P 3V6

Mike Rawlings
Manager (A), Water Quality Analyses Section
Laboratory Services Branch
125 Resources Road
Etobicoke, Ontario
M9P 3V6

Dan Toner
Manager (A), Air and Biomaterials Analyses Section
Laboratory Services Branch
125 Resources Road
Etobicoke, Ontario
M9P 3V6

Frank Tomassini
Manager, Lab Systems and Client Services Section
Laboratory Services Branch
125 Resources Road
Etobicoke, Ontario
M9P 3V6

Don King
Supervisor, Quality Management Office
Laboratory Services Branch
125 Resources Road
Etobicoke, Ontario
M9P 3V6

Ann Jones
QA/QC Co-ordinator, Litigation and Waste Analyses Section
Laboratory Services Branch
125 Resources Road
Etobicoke, Ontario
M9P 3V6

Susan Janhurst
QA/QC Co-ordinator, Water Quality Analyses Section
Laboratory Services Branch
125 Resources Road
Etobicoke, Ontario
M9P 3V6

Mary Anne Bogard
QA/QC Co-ordinator, Air and Biomaterials Analyses Section
Laboratory Services Branch
125 Resources Road
Etobicoke, Ontario
M9P 3V6

Method Blanks Summary
Precipitation - XAD

January 1992 - December 1992

Analyte	Number of Observations	Average Weight (pg)	Standard Deviation (pg)
2,3,7,8-tetrachlorodibenzo-p-dioxin	6	ND (5)	
1,2,3,7,8-pentachlorodibenzo-p-dioxin	6	ND (5)	
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	6	ND (10)	
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	6	ND (10)	
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	6	ND (10)	
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	6	2.2	4.8
octachlorodibenzo-p-dioxin	6	12	20
2,3,7,8-tetrachlorodibenzofuran	6	ND (5)	
2,3,4,7,8-pentachlorodibenzofuran	6	ND (5)	
1,2,3,7,8-pentachlorodibenzofuran	6	ND (5)	
1,2,3,4,7,8-hexachlorodibenzofuran	6	ND (10)	
1,2,3,6,7,8-hexachlorodibenzofuran	6	ND (10)	
2,3,4,6,7,8-hexachlorodibenzofuran	6	ND (10)	
1,2,3,7,8,9-hexachlorodibenzofuran	6	ND (10)	
1,2,3,4,6,7,8-heptachlorodibenzofuran	6	ND (15)	
1,2,3,4,7,8,9-heptachlorodibenzofuran	6	ND (15)	
octachlorodibenzofuran	6	ND (20)	

ND ... Not detected. Detection limits in pg given in brackets ( ).

Method Blanks Summary
Precipitation - Funnel Rinses

January 1992 - December 1992

Analyte	Number of Observations	Average Weight (pg)	Standard Deviation (pg)
2,3,7,8-tetrachlorodibenzo-p-dioxin	5	ND (5)	
1,2,3,7,8-pentachlorodibenzo-p-dioxin	5	ND (5)	
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	5	ND (10)	
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	5	ND (10)	
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	5	ND (10)	
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	5	11	22
octachlorodibenzo-p-dioxin	5	44	88
2,3,7,8-tetrachlorodibenzofuran	5	3.4	6.8
2,3,4,7,8-pentachlorodibenzofuran	5	ND (5)	
1,2,3,7,8-pentachlorodibenzofuran	5	2.2	4.4
1,2,3,4,7,8-hexachlorodibenzofuran	5	ND (10)	
1,2,3,6,7,8-hexachlorodibenzofuran	5	ND (10)	
2,3,4,6,7,8-hexachlorodibenzofuran	5	ND (10)	
1,2,3,7,8,9-hexachlorodibenzofuran	5	ND (10)	
1,2,3,4,6,7,8-heptachlorodibenzofuran	5	6	12
1,2,3,4,7,8,9-heptachlorodibenzofuran	5	ND (15)	
octachlorodibenzofuran	5	6	12

METHOD CODE : PFAFD-E3134A
METHOD TITLE: The Determination of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans in Fish and Biota

LABORATORY : Dioxin Unit
SUPERVISOR : Dr. E. Reiner

SAMPLE TYPE : fish tissue and other biological tissue (clams, shrimps)

PRINCIPLE OF THE METHOD :

Samples are homogenized by mechanical grinding of the tissue. A portion of the homogeneous sample is fortified with a known quantity of isotopically labelled PCDDs and PCDFs to serve as an internal quantitation standard and is digested overnight with concentrated hydrochloric acid. The digested solution is extracted with hexane and the extract is passed through a column containing anhydrous sodium sulphate and sulphuric acid-modified silica gel.

The extract is concentrated and subsequently fractionated using high performance liquid chromatography (HPLC). The reconstituted final extract is analyzed by gas chromatography - tandem mass spectrometry (GC-MS-MS) or gas chromatography - high resolution mass spectrometry (GC-HRMS).

PARAMETERS MEASURED :	**IDL (pg/g)**
2,3,7,8-tetrachlorodibenzo-p-dioxin	1
1,2,3,7,8-pentachlorodibenzo-p-dioxin	1
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	2
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	2
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	2
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	3
octachlorodibenzo-p-dioxin	5
2,3,7,8-tetrachlorodibenzofuran	1
2,3,4,7,8-pentachlorodibenzofuran	1
1,2,3,7,8-pentachlorodibenzofuran	1
1,2,3,4,7,8-hexachlorodibenzofuran	2
1,2,3,6,7,8-hexachlorodibenzofuran	2
2,3,4,6,7,8-hexachlorodibenzofuran	2
1,2,3,7,8,9-hexachlorodibenzofuran	2
1,2,3,4,6,7,8-heptachlorodibenzofuran	3
1,2,3,4,7,8,9-heptachlorodibenzofuran	3
octachlorodibenzofuran	5

total tetrachlorinated dibenzo-p-dioxins (TCDD)
total pentachlorinated dibenzo-p-dioxins (PCDD)
total hexachlorinated dibenzo-p-dioxins (HxCDD)

(Parameters Measured continued)

total heptachlorinated dibenzo-p-dioxins (HpCDD)
total tetrachlorinated dibenzofurans (TCDF)
total pentachlorinated dibenzofurans (PCDF)
total hexachlorinated dibenzofurans (HxCDF)
total heptachlorinated dibenzofurans (HpCDF)

REPORTING FORMAT :

Results are reported as ppt (picograms of CDD/CDF per gram of wet fish tissue) rounded off to 2 significant figures. The minimum reported levels are sample and analyte specific * and range from 1 pg/g to 10 pg/g.

QUALITY CONTROL :

The routine quality control operations monitor overall method performance (precision and recovery samples), validity of calibration and consistency in injection volume (injection standard), absence of potential contamination (method blanks) and recovery of target analytes (internal quantitation standard).

REMARKS : Two types of performance limits are displayed on the performance charts. One set was statistically derived from the 1992 data; while the other (established at recoveries of 70% and 130%) was adopted by the Dioxin Unit as the method performance control limits.

List of Performance Charts and Tables:

Method Blanks Summary
2,3,7,8-tetrachlorodibenzo-p-dioxin
1,2,3,7,8-pentachlorodibenzo-p-dioxin
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin
octachlorodibenzo-p-dioxin
2,3,7,8-tetrachlorodibenzofuran
2,3,4,7,8-pentachlorodibenzofuran
1,2,3,7,8-pentachlorodibenzofuran
1,2,3,4,7,8-hexachlorodibenzofuran
1,2,3,6,7,8-hexachlorodibenzofuran
2,3,4,6,7,8-hexachlorodibenzofuran
1,2,3,7,8,9-hexachlorodibenzofuran
1,2,3,4,6,7,8-heptachlorodibenzofuran
1,2,3,4,7,8,9-heptachlorodibenzofuran
octachlorodibenzofuran

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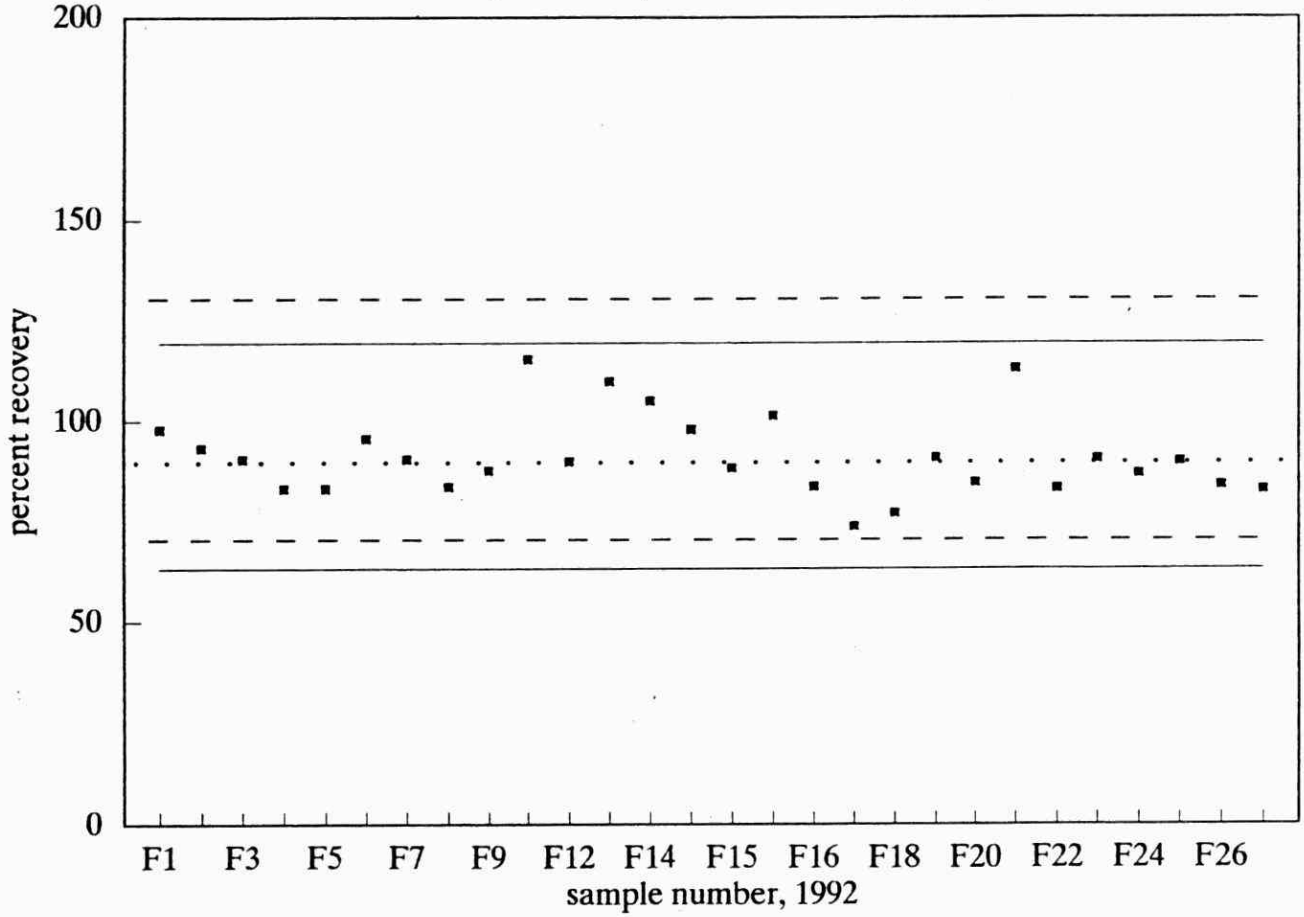
* The minimum reported levels correspond to the amount of analyte that would give most-abundant ion response five times higher than corresponding instrumental noise.

Method Blanks Summary January 1992 - December 1992

Analyte	Number of Observations	Average Concentration (pg/g)	Standard Deviation (pg/g)
2,3,7,8-tetrachlorodibenzo-p-dioxin	21	0.3	1.1
1,2,3,7,8-pentachlorodibenzo-p-dioxin	21	1.1	5.0
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	21	0.004	0.020
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	21	0.007	0.030
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	21	0.03	0.12
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	21	0.7	3.3
octachlorodibenzo-p-dioxin	21	5	20
2,3,7,8-tetrachlorodibenzofuran	21	1.2	3.1
2,3,4,7,8-pentachlorodibenzofuran	21	1.2	5.5
1,2,3,7,8-pentachlorodibenzofuran	21	1.1	4.9
1,2,3,4,7,8-hexachlorodibenzofuran	21	0.8	3.0
1,2,3,6,7,8-hexachlorodibenzofuran	21	0.8	3.3
2,3,4,6,7,8-hexachlorodibenzofuran	21	1.1	4.5
1,2,3,7,8,9-hexachlorodibenzofuran	21	1.1	4.4
1,2,3,4,6,7,8-heptachlorodibenzofuran	21	0.7	2.8
1,2,3,4,7,8,9-heptachlorodibenzofuran	21	0.9	3.2
octachlorodibenzofuran	21	2.3	8.6

2,3,7,8–tetrachlorodibenzo–p–dioxin

recovery from fish precision & recovery samples



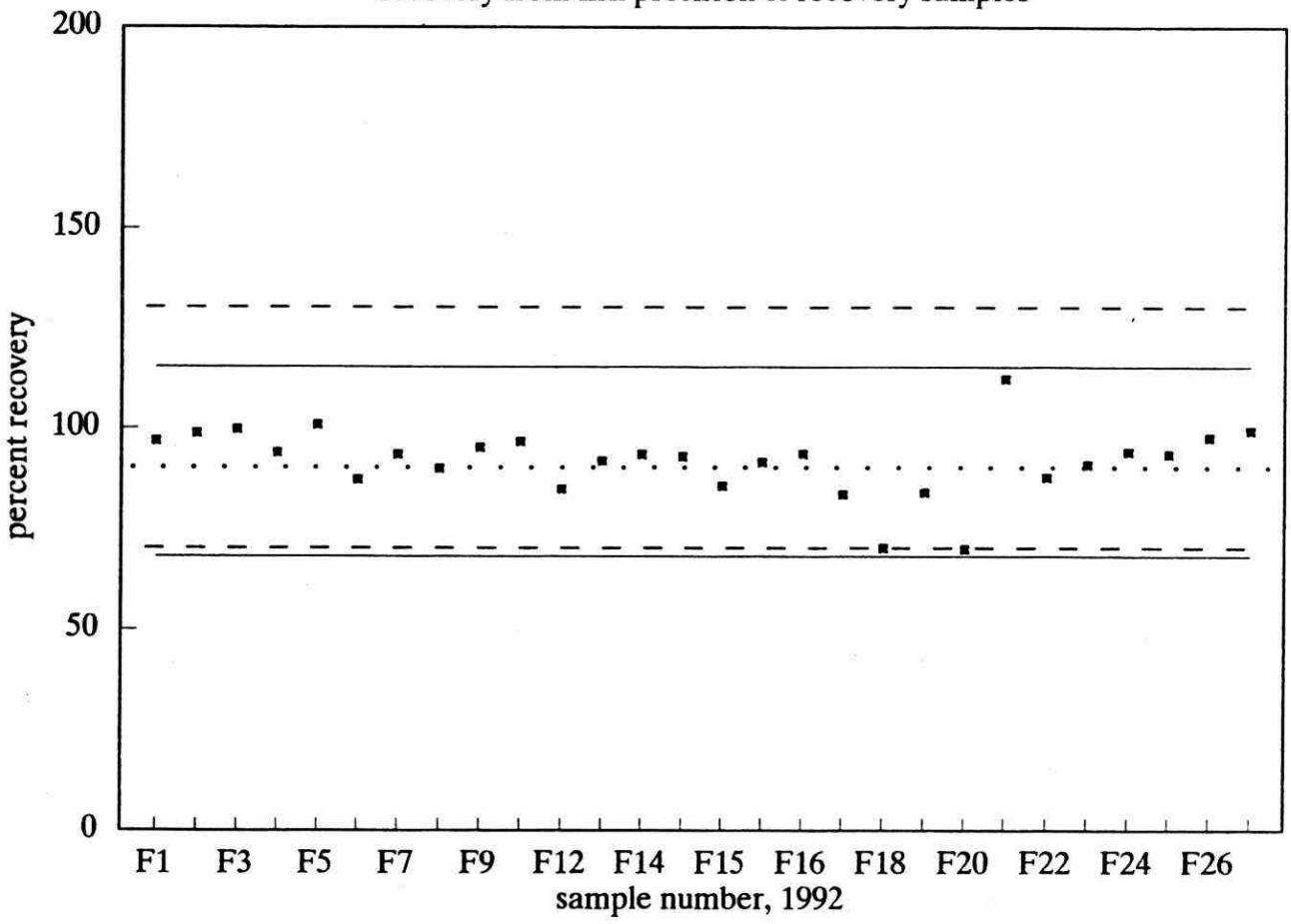
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	2,3,7,8-tetrachlorodibenzo-p-dioxin
True Concentration	15 pg/g
Number of Observations	28
Between-run Standard Deviation	10 %
Accuracy (% of expected)	91 %

1,2,3,7,8–pentachlorodibenzo–p–dioxin

recovery from fish precision & recovery samples



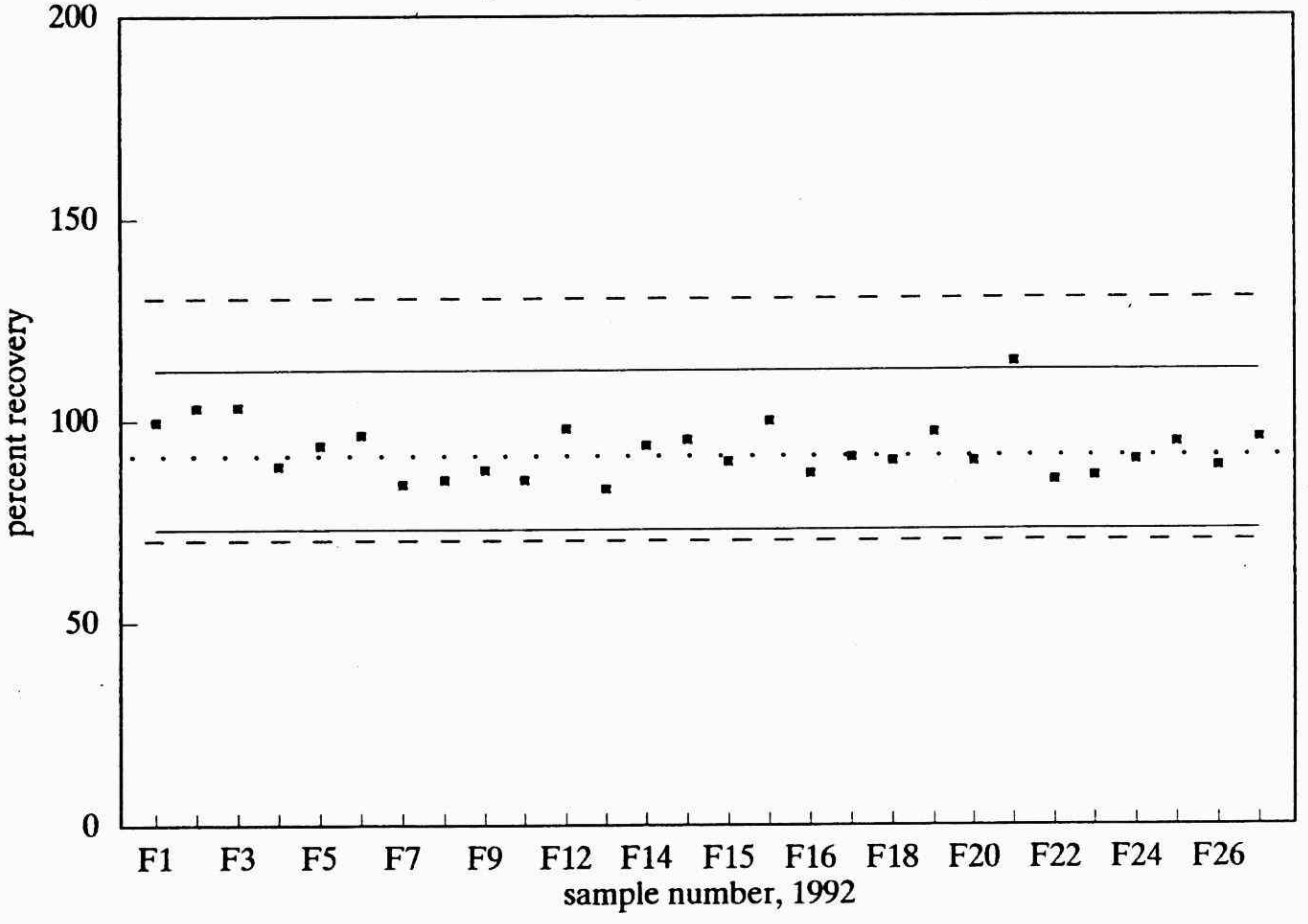
. . . . . average recovery (% of expected)
_____ 99% confidence limits
_ _ _ _ _ control limits

Performance Summary Table January - December 1992

Analyte	1,2,3,7,8-pentachlorodibenzo-p-dioxin
True Concentration	75 pg/g
Number of Observations	28
Between-run Standard Deviation	9 %
Accuracy (% of expected)	92 %

1,2,3,4,7,8–hexachlorodibenzo–p–dioxin

recovery from fish precision & recovery samples



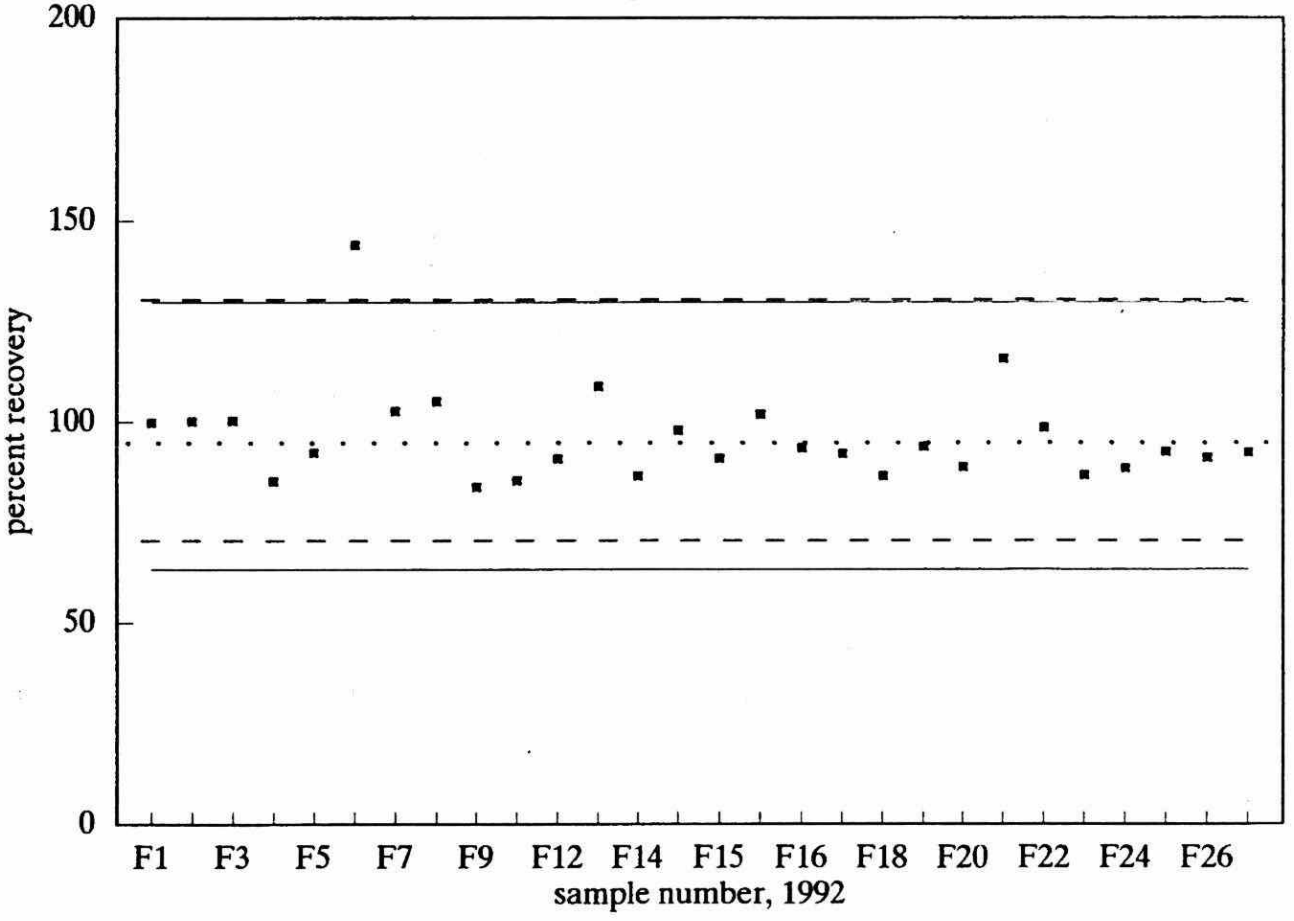
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,4,7,8-hexachlorodibenzo-p-dioxin
True Concentration	75 pg/g
Number of Observations	28
Between-run Standard Deviation	7 %
Accuracy (% of expected)	93 %

1,2,3,6,7,8–hexachlorodibenzo–p–dioxin

recovery from fish precision & recovery samples



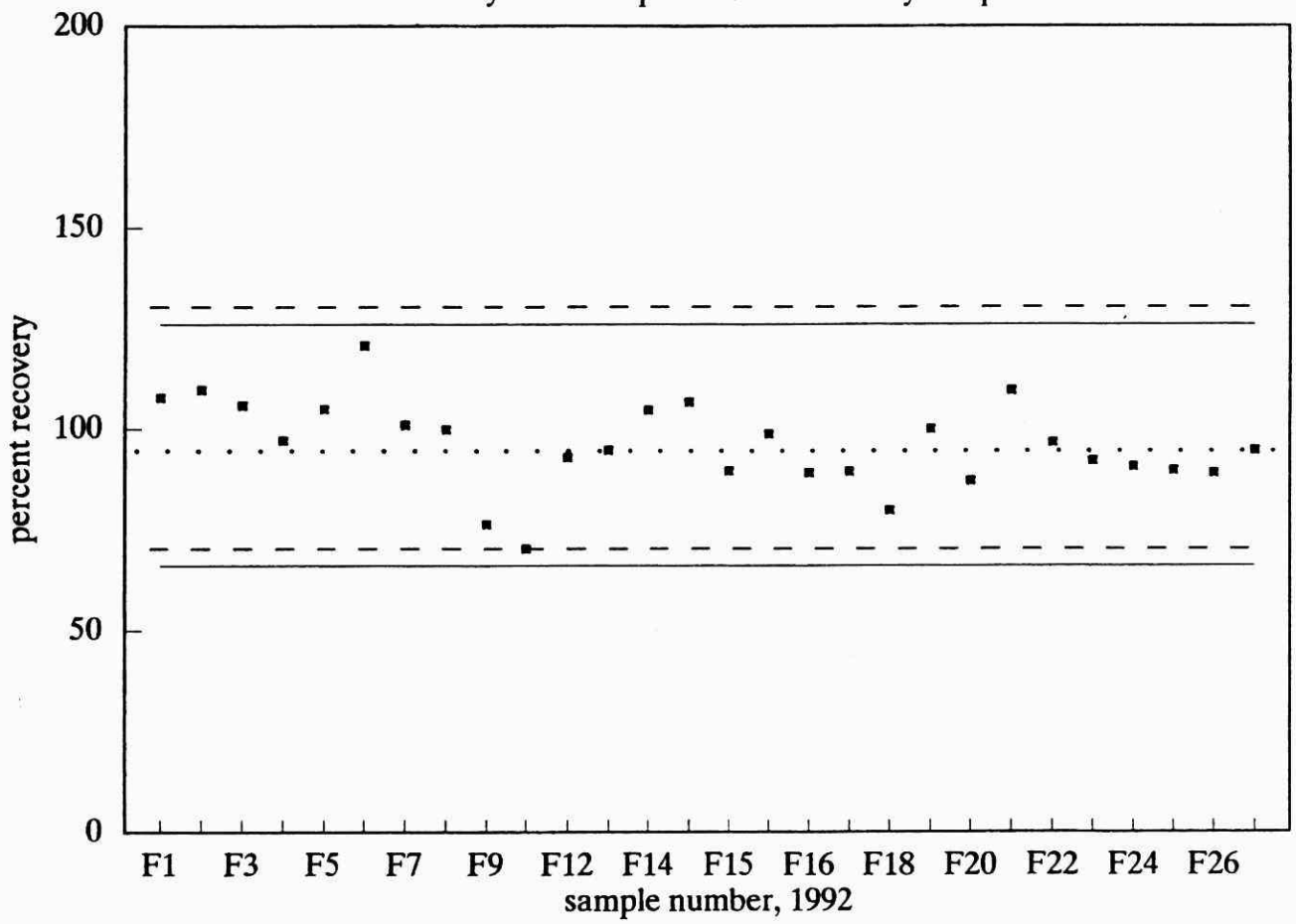
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table January - December 1992

Analyte	1,2,3,6,7,8-hexachlorodibenzo-p-dioxin
True Concentration	75 pg/g
Number of Observations	26
Between-run Standard Deviation	12 %
Accuracy (% of expected)	96 %

1,2,3,7,8,9–hexachlorodibenzo–p–dioxin

recovery from fish precision & recovery samples



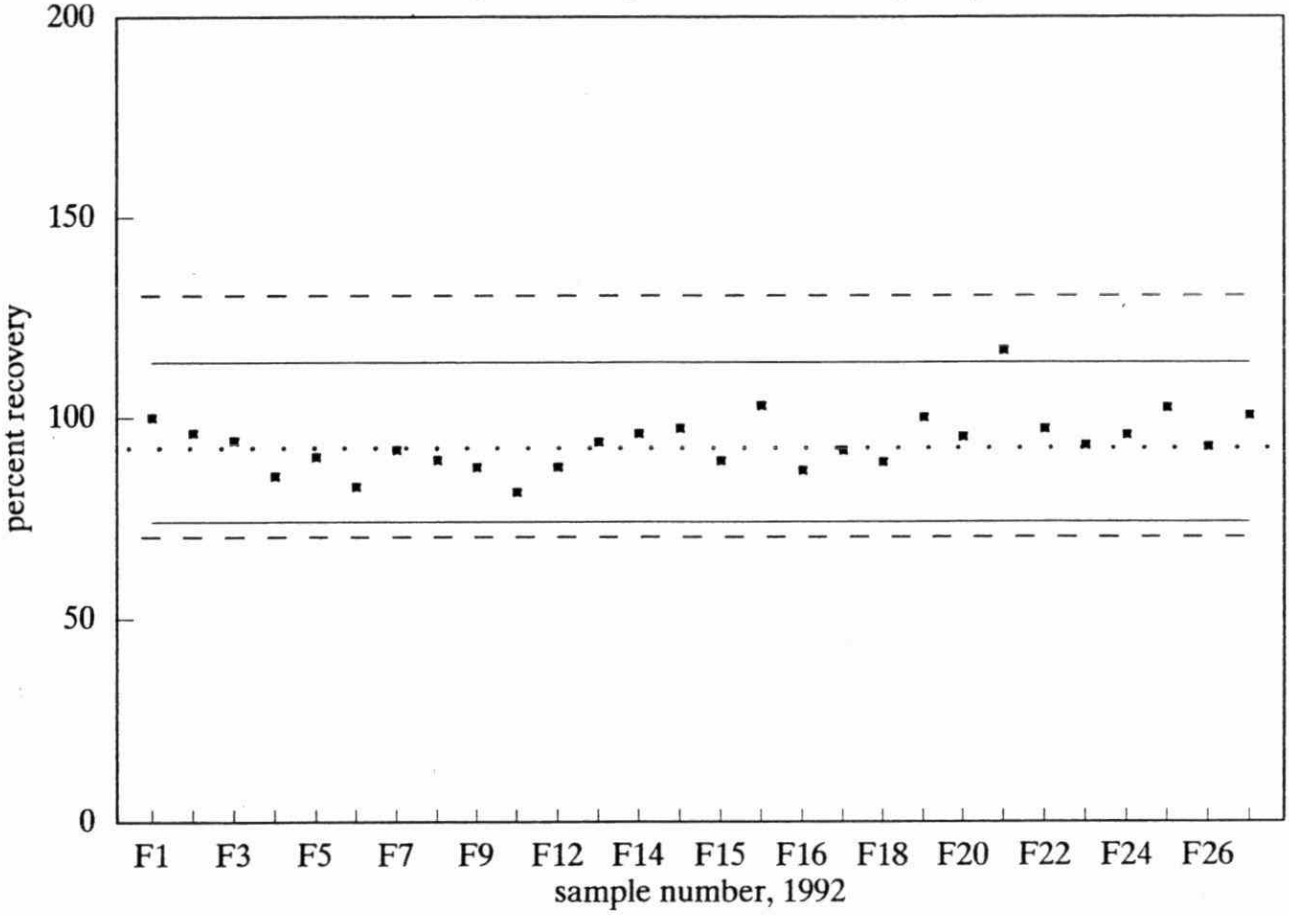
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,7,8,9-hexachlorodibenzo-p-dioxin
True Concentration	75 pg/g
Number of Observations	26
Between-run Standard Deviation	11 %
Accuracy (% of expected)	96 %

1,2,3,4,6,7,8–heptachlorodibenzo–p–dioxin

recovery from fish precision & recovery samples



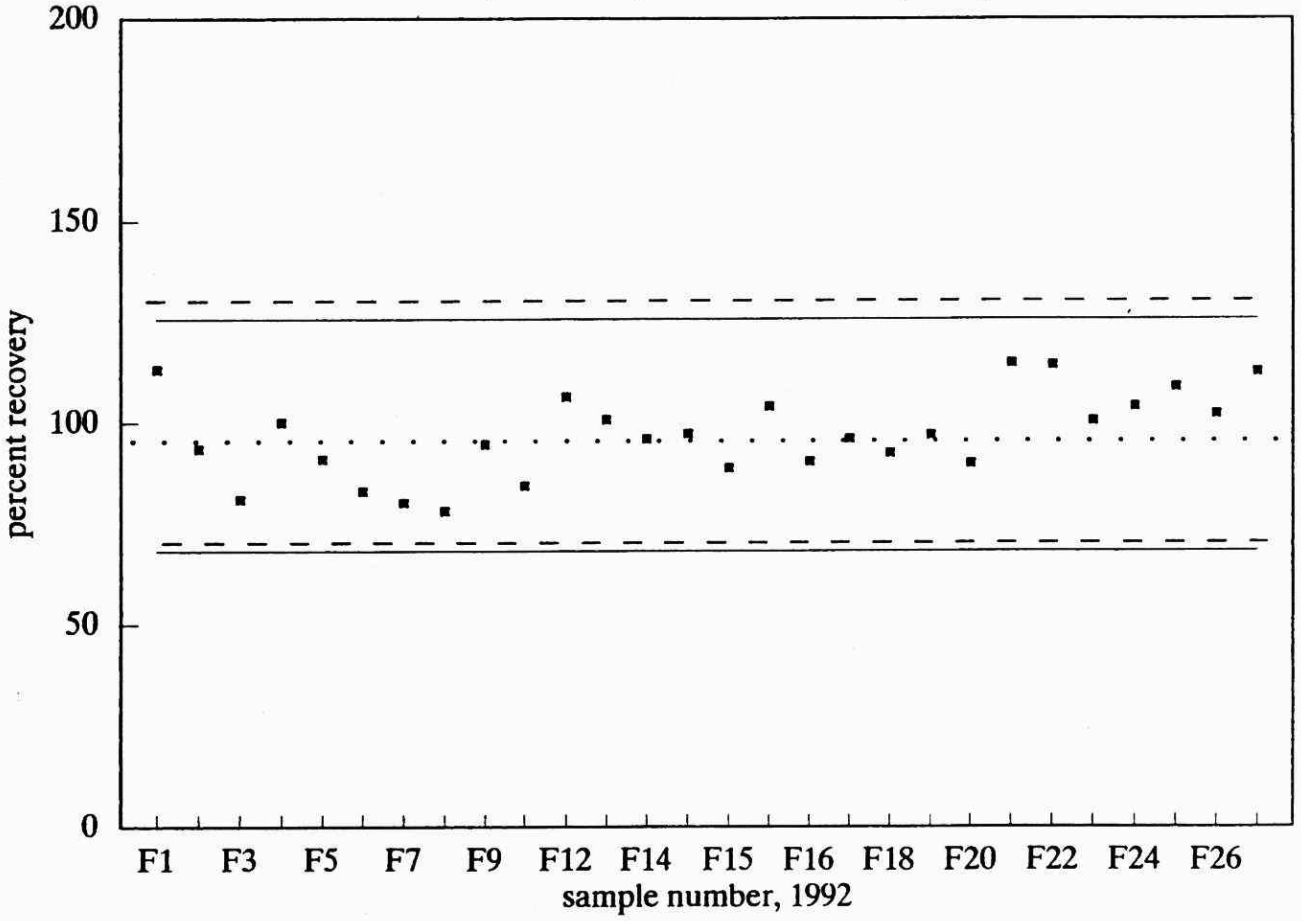
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin
True Concentration	75 pg/g
Number of Observations	28
Between-run Standard Deviation	7 %
Accuracy (% of expected)	94 %

octachlorodibenzo–p–dioxin

recovery from fish precision & recovery samples



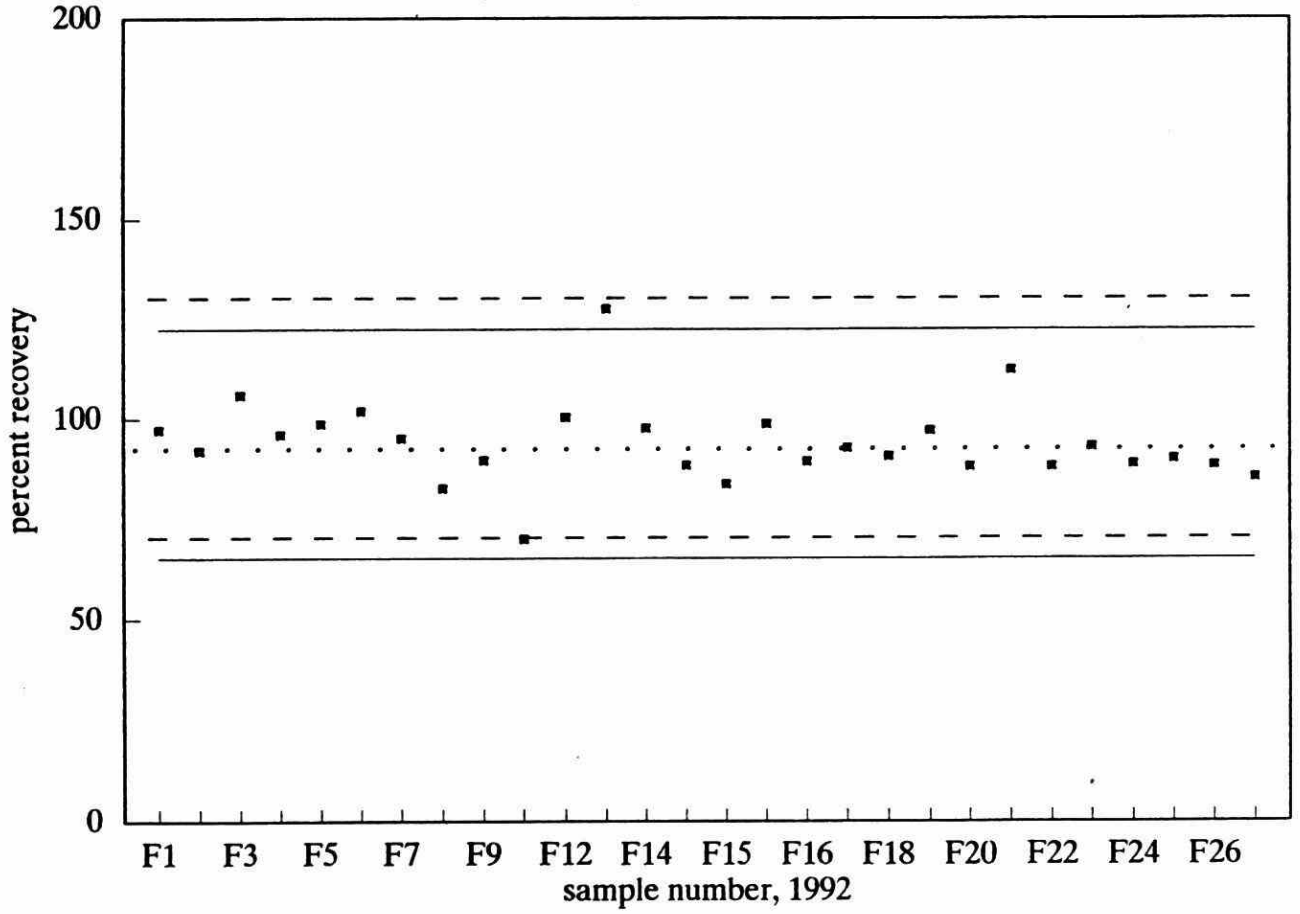
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	octachlorodibenzo-p-dioxin
True Concentration	150 pg/g
Number of Observations	27
Between-run Standard Deviation	10 %
Accuracy (% of expected)	97 %

2,3,7,8–tetrachlorodibenzofuran

recovery from fish precision & recovery samples



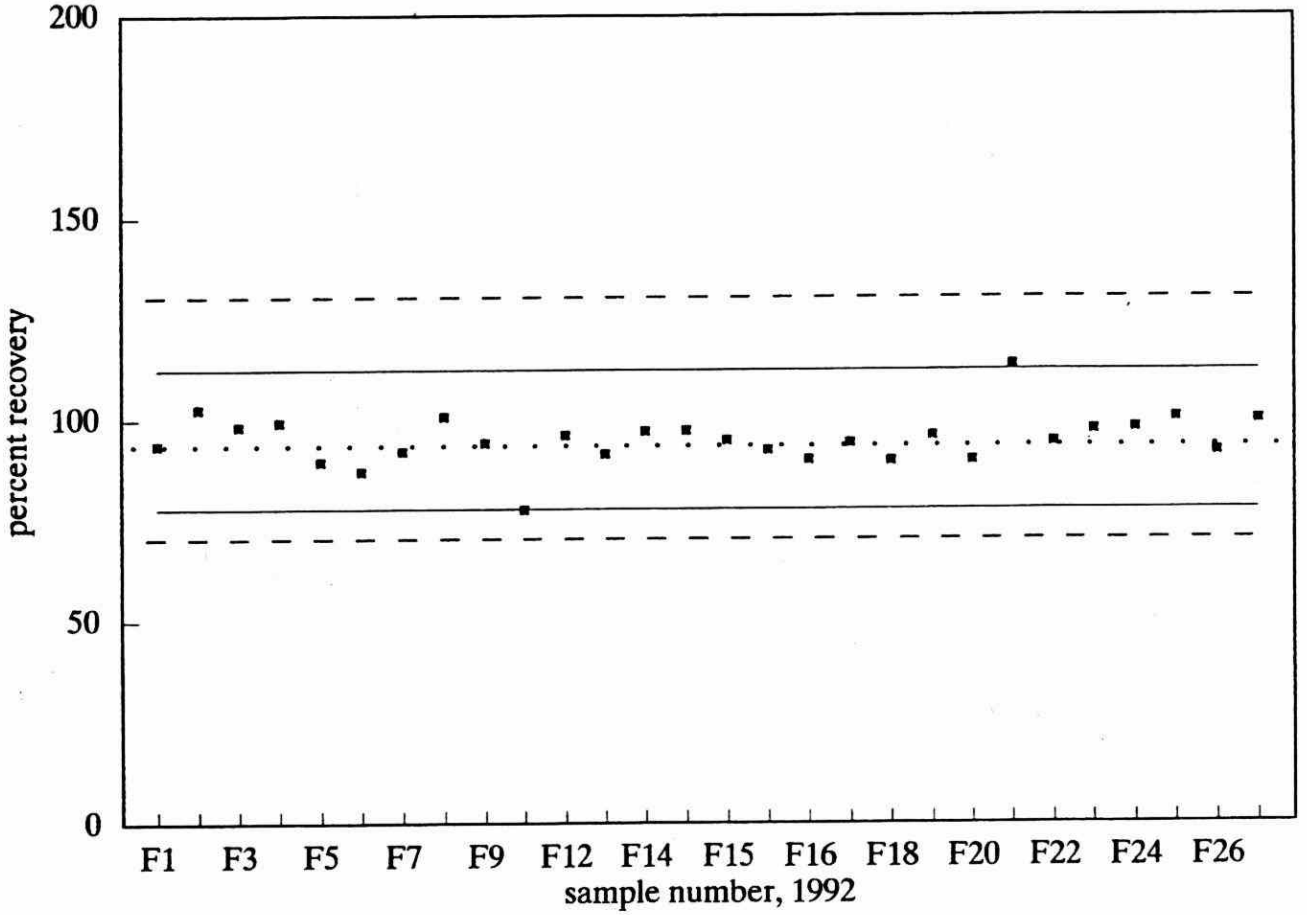
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	2,3,7,8-tetrachlorodibenzofuran
True Concentration	15 pg/g
Number of Observations	28
Between-run Standard Deviation	10 %
Accuracy (% of expected)	94 %

2,3,4,7,8–pentachlorodibenzofuran

recovery from fish precision & recovery samples



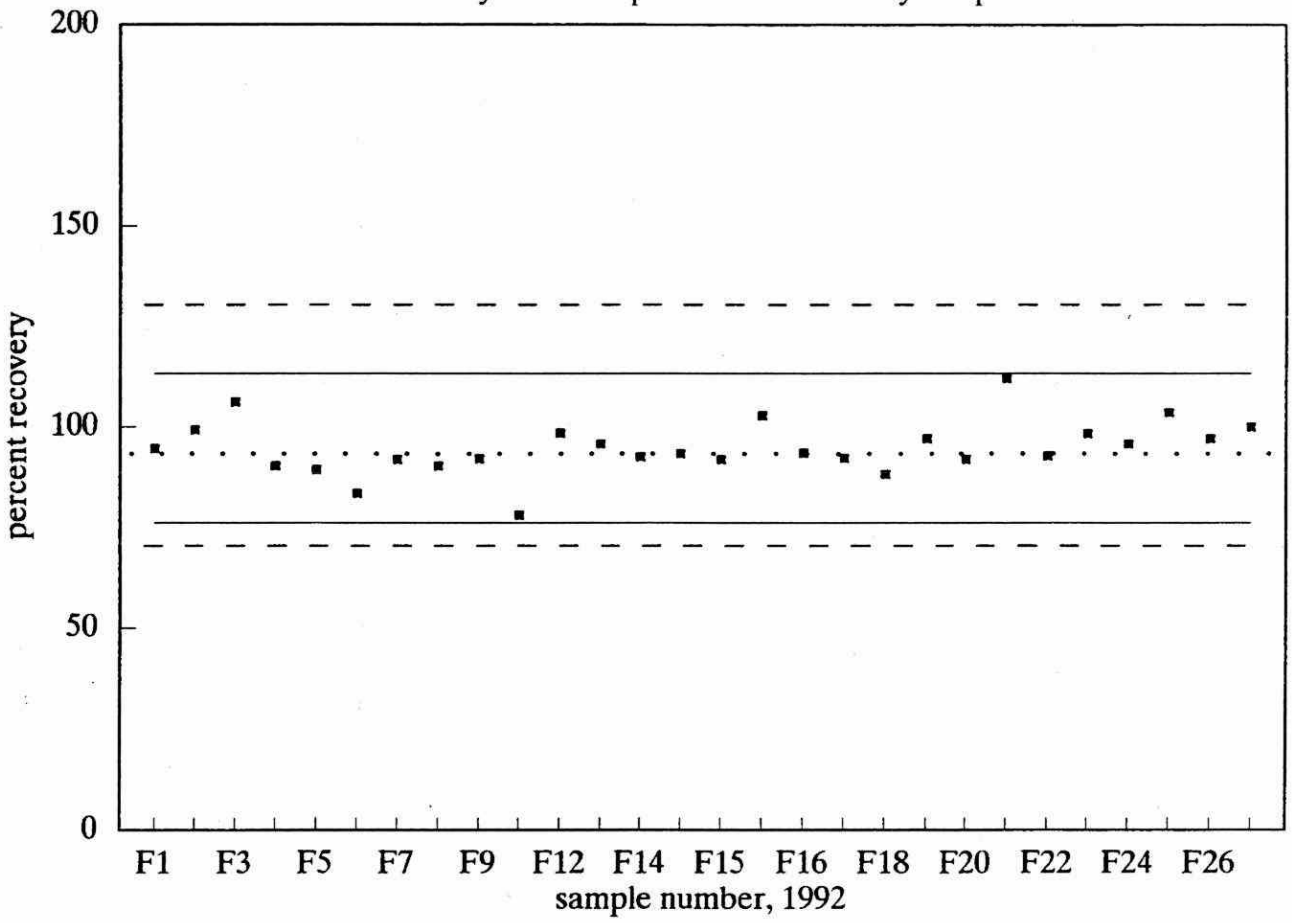
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	2,3,4,7,8-pentachlorodibenzofuran
True Concentration	75 pg/g
Number of Observations	28
Between-run Standard Deviation	6 %
Accuracy (% of expected)	95 %

1,2,3,7,8–pentachlorodibenzofuran

recovery from fish precision & recovery samples



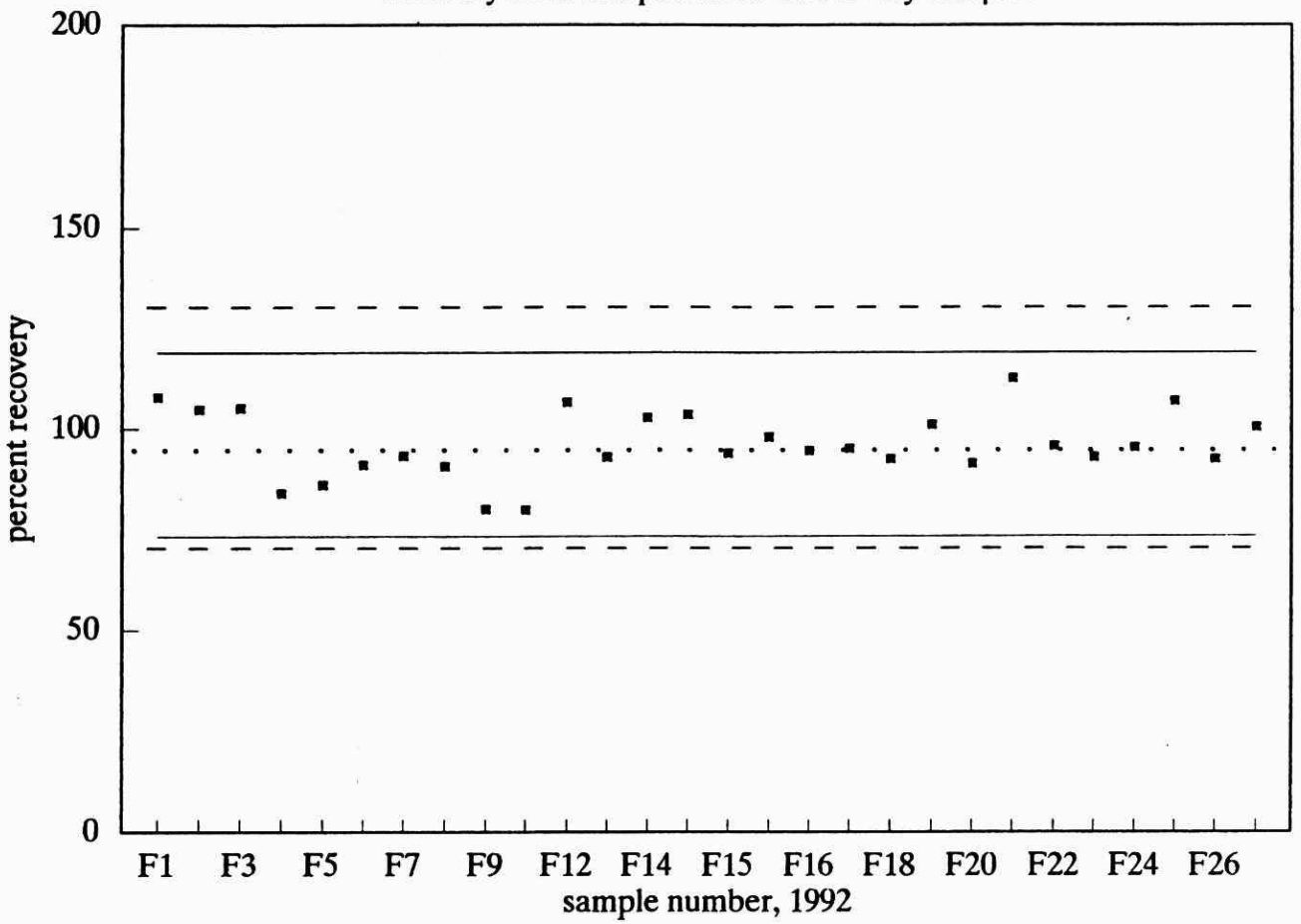
. . . . . average recovery (% of expected)
_____ 99% confidence limits
- - - - - control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,7,8-pentachlorodibenzofuran
True Concentration	75 pg/g
Number of Observations	28
Between-run Standard Deviation	7 %
Accuracy (% of expected)	95 %

1,2,3,4,7,8–hexachlorodibenzofuran

recovery from fish precision & recovery samples



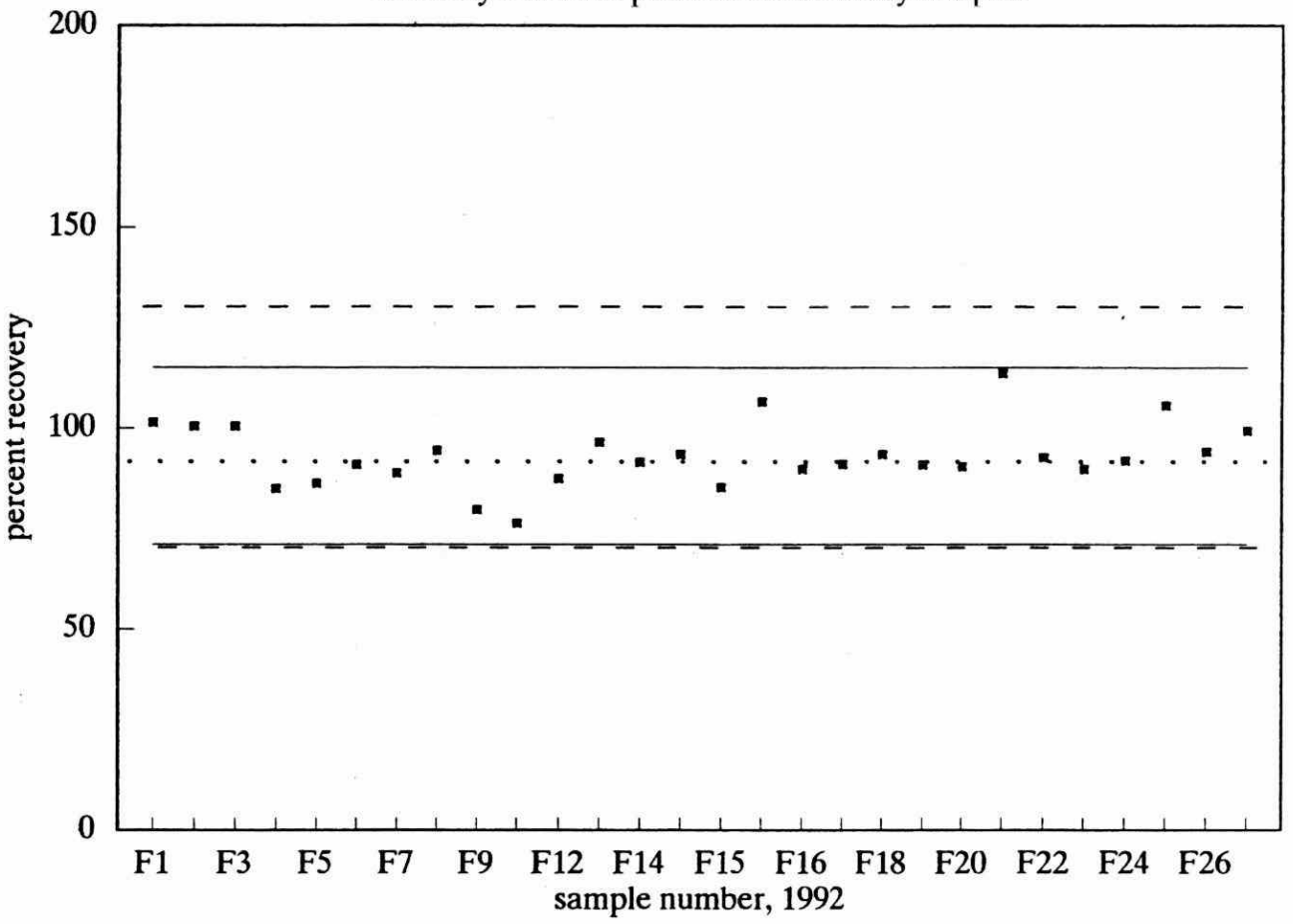
. . . . . average recovery (% of expected)
_____ 99% confidence limits
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,4,7,8-hexachlorodibenzofuran
True Concentration	75 pg/g
Number of Observations	28
Between-run Standard Deviation	8 %
Accuracy (% of expected)	96 %

1,2,3,6,7,8–hexachlorodibenzofuran

recovery from fish precision & recovery samples



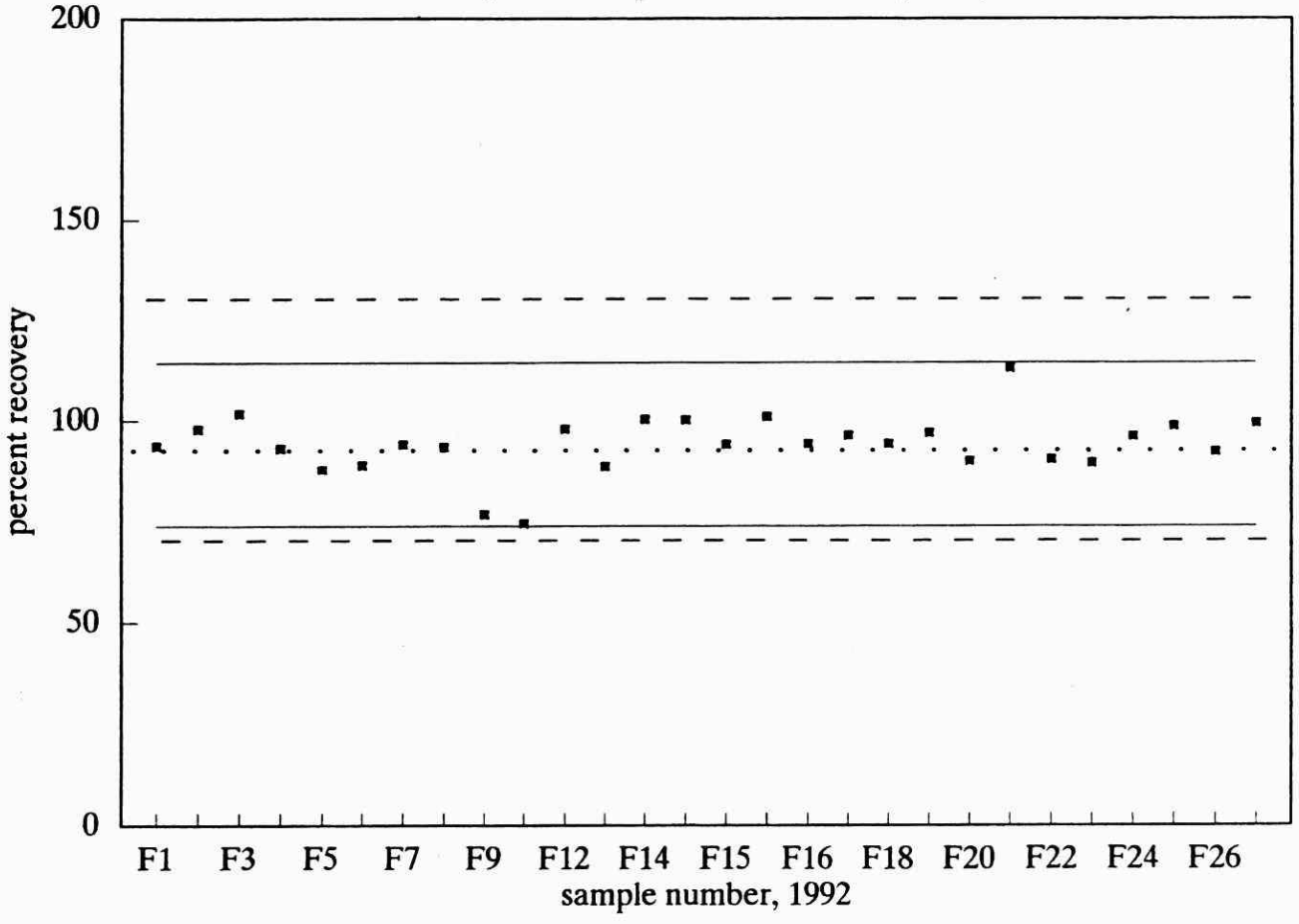
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table January - December 1992

Analyte	1,2,3,6,7,8-hexachlorodibenzofuran
True Concentration	75 pg/g
Number of Observations	28
Between-run Standard Deviation	8 %
Accuracy (% of expected)	93 %

2,3,4,6,7,8–hexachlorodibenzofuran

recovery from fish precision & recovery samples



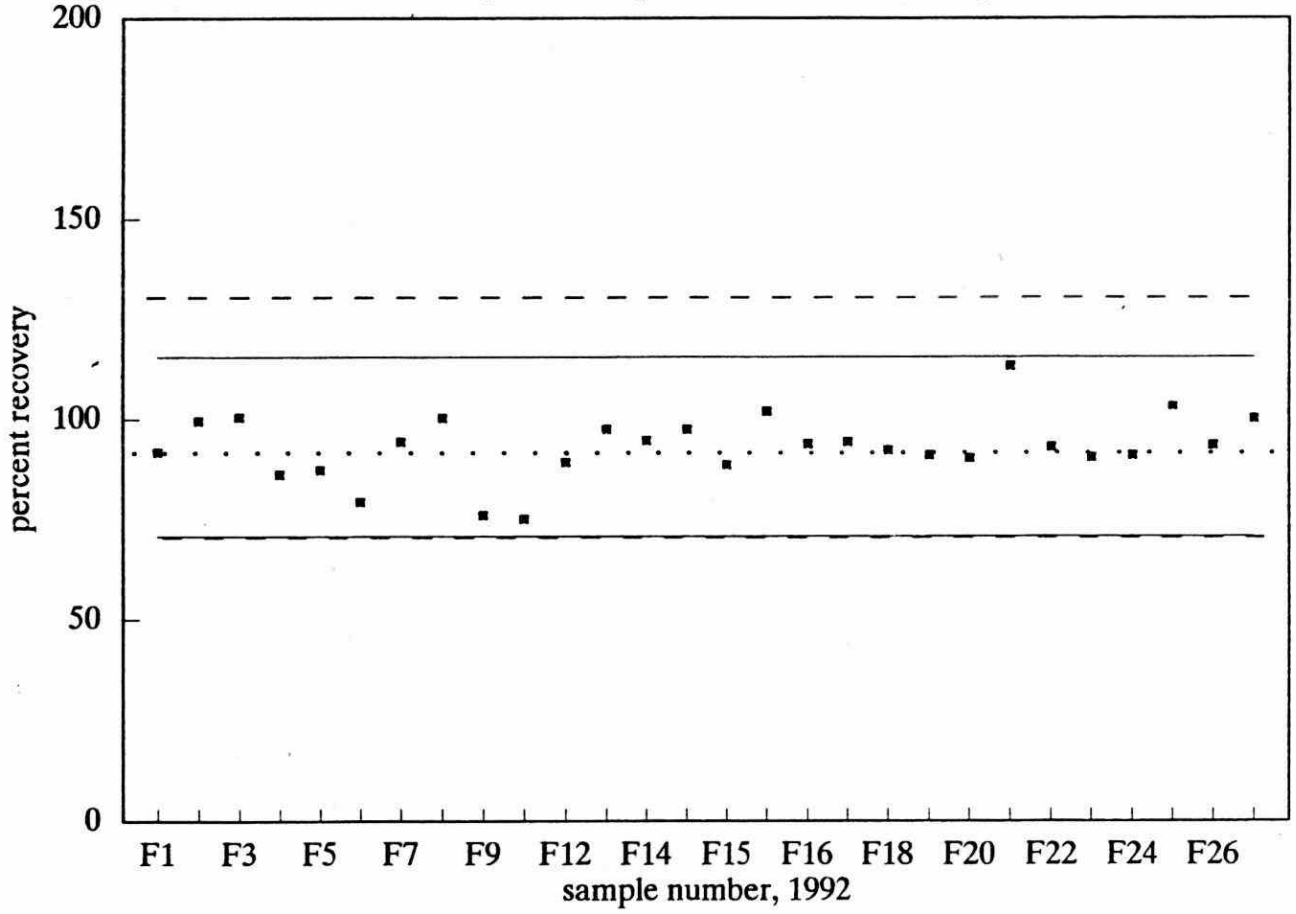
. . . . . average recovery (% of expected)
_____ 99% confidence limits
- - - - - control limits

Performance Summary Table — January - December 1992

Analyte	2,3,4,6,7,8-hexachlorodibenzofuran
True Concentration	75 pg/g
Number of Observations	28
Between-run Standard Deviation	7 %
Accuracy (% of expected)	94 %

1,2,3,7,8,9–hexachlorodibenzofuran

recovery from fish precision & recovery samples



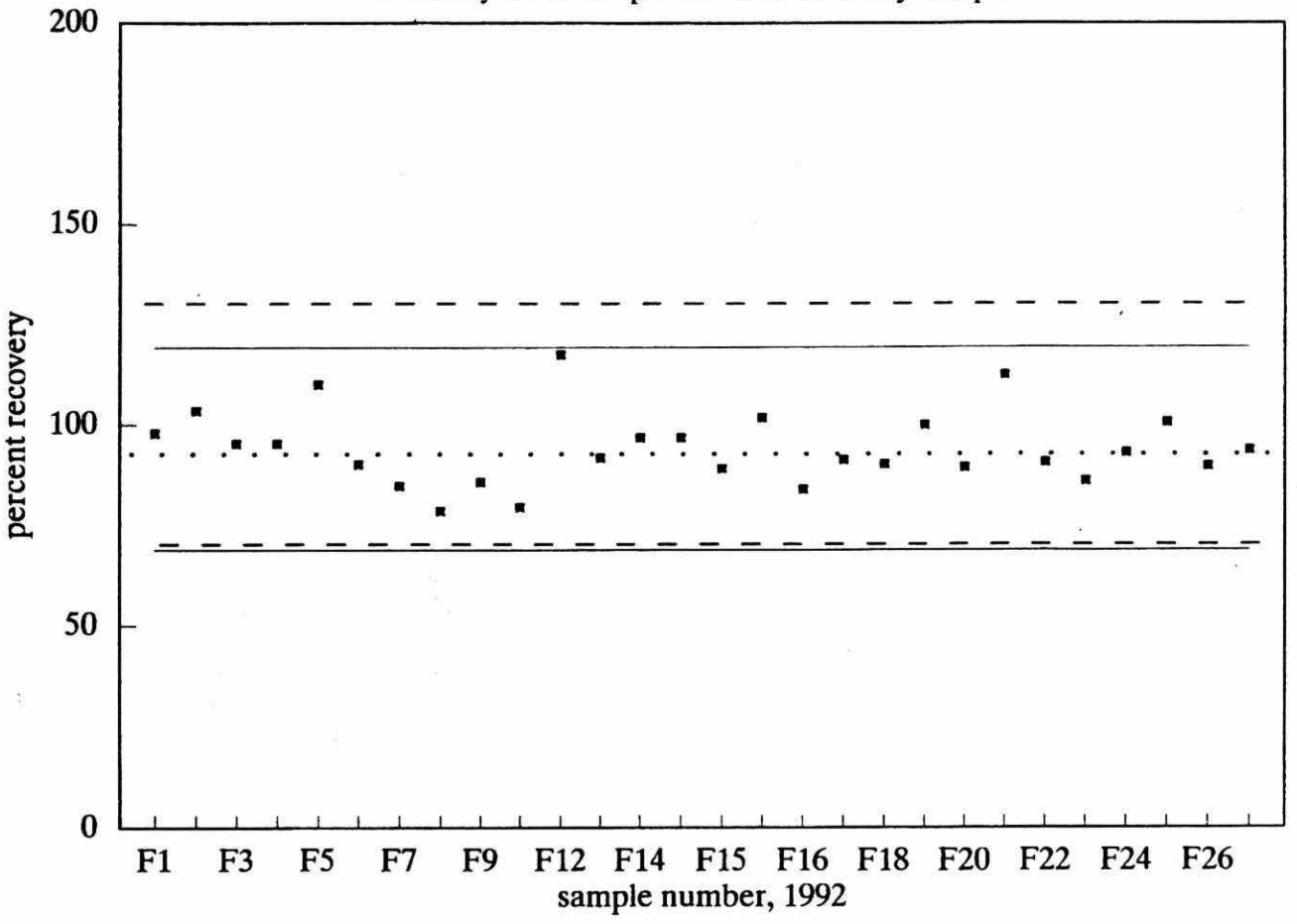
. . . . . average recovery (% of expected)
_____ 99% confidence limits
- - - - - control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,7,8,9-hexachlorodibenzofuran
True Concentration	75 pg/g
Number of Observations	28
Between-run Standard Deviation	8 %
Accuracy (% of expected)	93 %

1,2,3,4,6,7,8–heptachlorodibenzofuran

recovery from fish precision & recovery samples



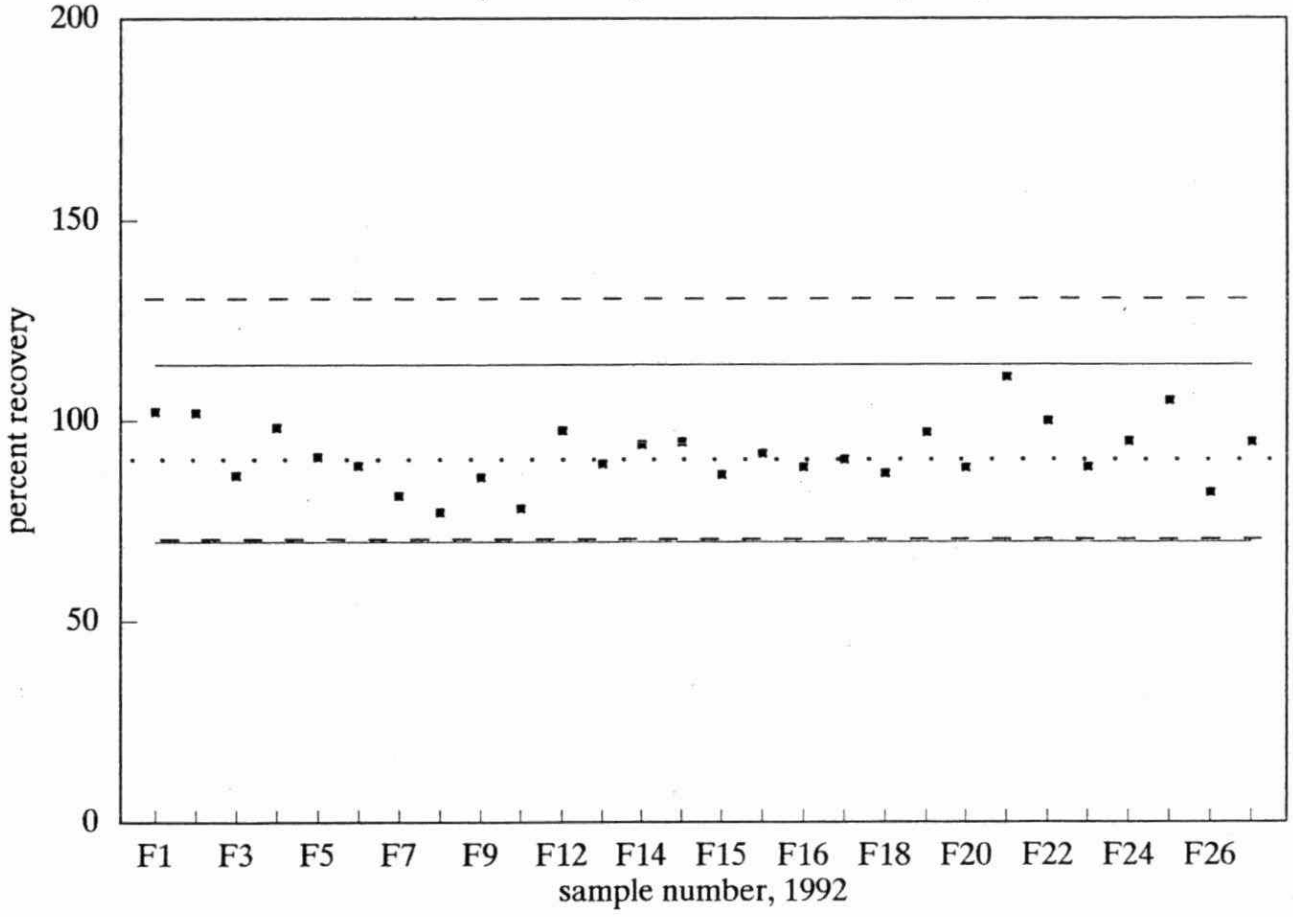
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,4,6,7,8-heptachlorodibenzofuran
True Concentration	75 pg/g
Number of Observations	28
Between-run Standard Deviation	9 %
Accuracy (% of expected)	94 %

1,2,3,4,7,8,9–heptachlorodibenzofuran

recovery from fish precision & recovery samples



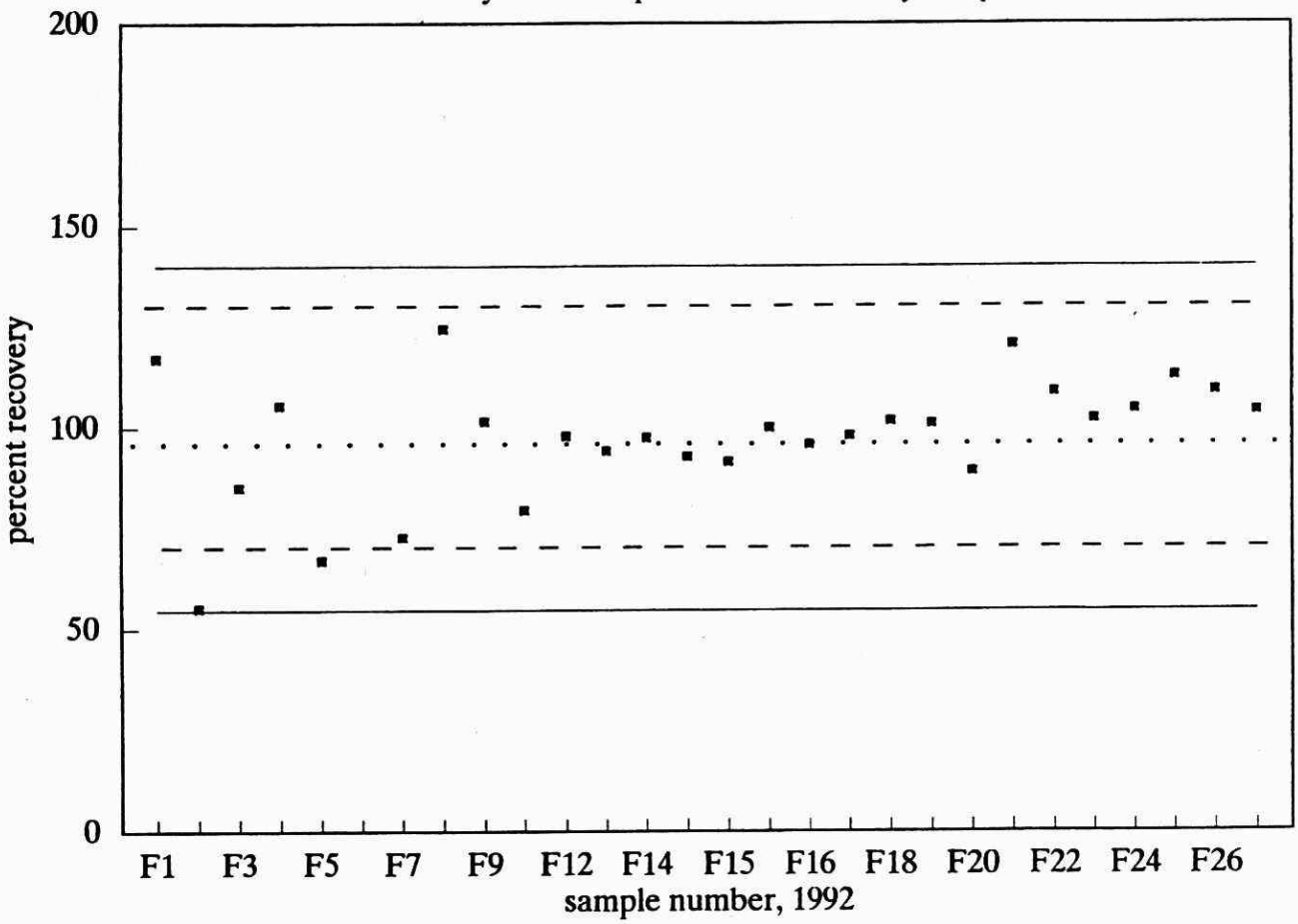
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table January - December 1992

Analyte	1,2,3,4,7,8,9-heptachlorodibenzofuran
True Concentration	75 pg/g
Number of Observations	28
Between-run Standard Deviation	8 %
Accuracy (% of expected)	92 %

octachlorodibenzofuran

recovery from fish precision & recovery samples



. . . . . average recovery (% of expected)
_____ 99% confidence limits
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	octachlorodibenzofuran
True Concentration	150 pg/g
Number of Observations	27
Between-run Standard Deviation	16 %
Accuracy (% of expected)	97 %

METHOD CODE : PSAFD-E3151B
METHOD TITLE: The Determination of Polychlorinated Dibenzo-p-dioxins (PCDD) and Polychlorinated Dibenzofurans (PCDF) in Soil and Sediment

LABORATORY : Dioxin Unit
SUPERVISOR : Dr. E. Reiner

SAMPLE TYPE : soil and sediment

PRINCIPLE OF THE METHOD :

Samples are dried, ground and homogenized. A known quantity of isotopically labelled PCDDs and PCDFs is added to the sample to serve as an internal quantitaion standard. PCDDs and PCDFs are extracted from soil/sediment using a Soxhlet extraction apparatus and toluene. The concentrated extract is processed through a multi-stage chromatographic cleanup procedure to remove potential chemical interferences.

The reconstituted final extract is analyzed by gas chromatography - tandem mass spectrometry (GC-MS-MS) or gas chromatography - high resolution mass spectrometry (GC-HRMS).

Further cleanup using high performance liquid chromatography (HPLC) may be necessary prior to final analysis if the sample is highly contaminated with chemical interferences that are not removed by the open-column chromatographic cleanup.

PARAMETERS MEASURED :	**IDL (pg/g)**	**MDL (pg/g)**
2,3,7,8-tetrachlorodibenzo-p-dioxin	1	2
1,2,3,7,8-pentachlorodibenzo-p-dioxin	2	4
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	3	3
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	3	3
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	3	3
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	5	5
octachlorodibenzo-p-dioxin	7	7
2,3,7,8-tetrachlorodibenzofuran	1	2
2,3,4,7,8-pentachlorodibenzofuran	2	5
1,2,3,7,8-pentachlorodibenzofuran	2	4
1,2,3,4,7,8-hexachlorodibenzofuran	3	3
1,2,3,6,7,8-hexachlorodibenzofuran	3	4
2,3,4,6,7,8-hexachlorodibenzofuran	3	3
1,2,3,7,8,9-hexachlorodibenzofuran	3	3
1,2,3,4,6,7,8-heptachlorodibenzofuran	5	6
1,2,3,4,7,8,9-heptachlorodibenzofuran	5	8
octachlorodibenzofuran	7	10

(Parameters Measured continued)

total tetrachlorinated dibenzo-p-dioxins (TCDD)
total pentachlorinated dibenzo-p-dioxins (PCDD)
total hexachlorinated dibenzo-p-dioxins (HxCDD)
total heptachlorinated dibenzo-p-dioxins (HpCDD)
total tetrachlorinated dibenzofurans (TCDF)
total pentachlorinated dibenzofurans (PCDF)
total hexachlorinated dibenzofurans (HxCDF)
total heptachlorinated dibenzofurans (HpCDF)

REPORTING FORMAT :

Results are reported as ppt (picograms of CDD/CDF per gram of dry soil) rounded off to 2 significant figures. The minimum reported levels are sample and analyte specific * and range from 1 pg/g to 10 pg/g.

QUALITY CONTROL :

The routine quality control operations monitor overall method performance (precision and recovery samples), validity of calibration and consistency in injection volume (injection standard), absence of potential contamination (method blanks) and recovery of target analytes (internal quantitation standard).

REMARKS : The performance limits (established at recoveries of 70% and 130%) were adopted by the Dioxin Unit as the method performance control limits.

List of Performance Charts and Tables:

Method Blanks Summary

2,3,7,8-tetrachlorodibenzo-p-dioxin
1,2,3,7,8-pentachlorodibenzo-p-dioxin
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin
octachlorodibenzo-p-dioxin

2,3,7,8-tetrachlorodibenzofuran
2,3,4,7,8-pentachlorodibenzofuran
1,2,3,7,8-pentachlorodibenzofuran
1,2,3,4,7,8-hexachlorodibenzofuran

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* The minimum reported levels correspond to the amount of analyte that would give most-abundant ion response five times higher than corresponding instrumental noise.

(List of Performance Charts and Tables continued)

1,2,3,6,7,8-hexachlorodibenzofuran
2,3,4,6,7,8-hexachlorodibenzofuran
1,2,3,7,8,9-hexachlorodibenzofuran
1,2,3,4,6,7,8-heptachlorodibenzofuran
1,2,3,4,7,8,9-heptachlorodibenzofuran
octachlorodibenzofuran

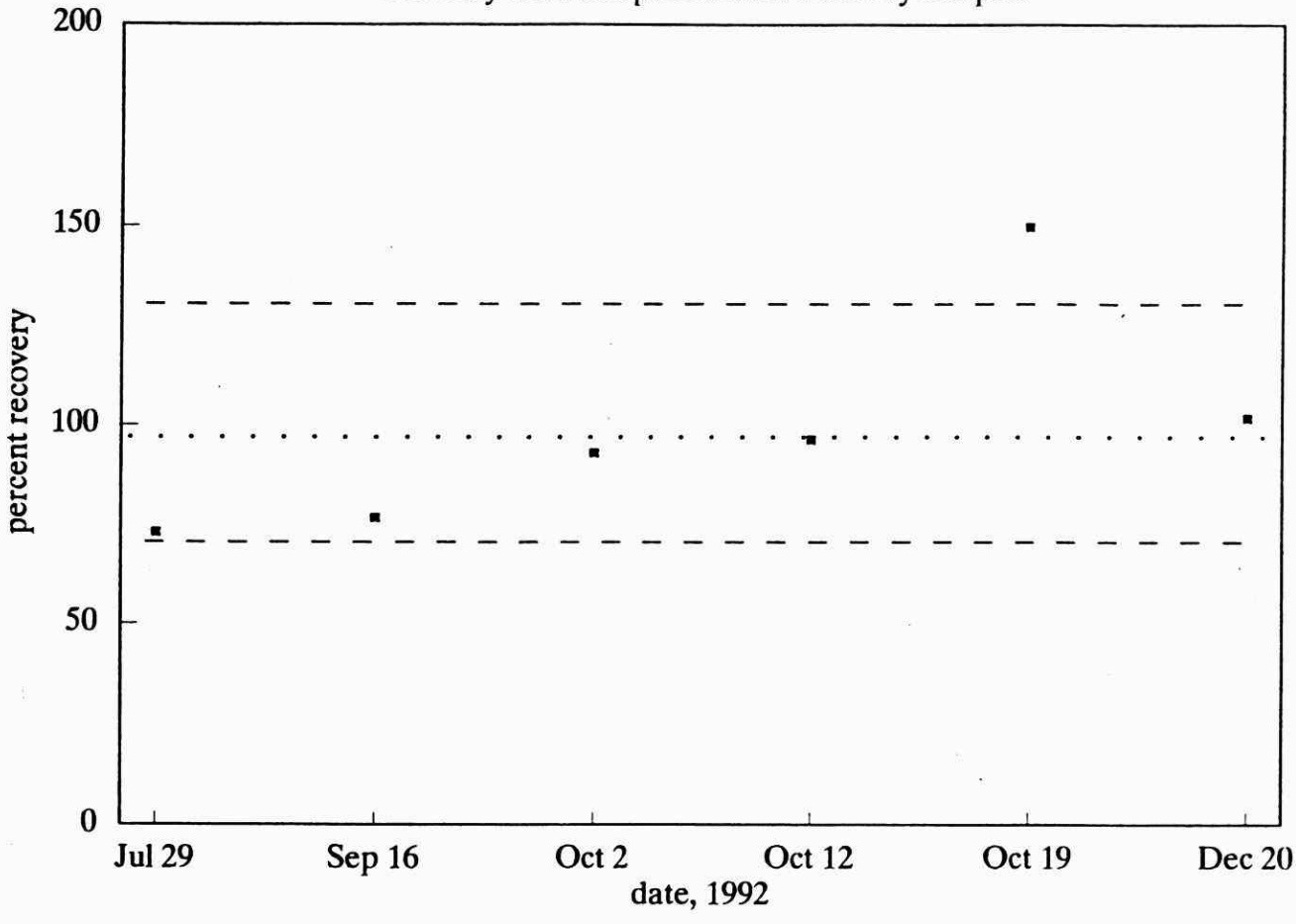
Method Blanks Summary January 1992 - December 1992

Analyte	Number of Observations	Average Concentration (pg/g)	Standard Deviation (pg/g)
2,3,7,8-tetrachlorodibenzo-p-dioxin	14	1.1	3.2
1,2,3,7,8-pentachlorodibenzo-p-dioxin	14	0.07	0.26
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	14	ND (3)	
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	14	ND (3)	
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	14	ND (3)	
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	14	1.2	3.8
octachlorodibenzo-p-dioxin	14	3.3	9.1
2,3,7,8-tetrachlorodibenzofuran	14	0.12	0.44
2,3,4,7,8-pentachlorodibenzofuran	14	ND (2)	
1,2,3,7,8-pentachlorodibenzofuran	14	ND (2)	
1,2,3,4,7,8-hexachlorodibenzofuran	14	2.3	8.3
1,2,3,6,7,8-hexachlorodibenzofuran	14	ND (3)	
2,3,4,6,7,8-hexachlorodibenzofuran	14	ND (3)	
1,2,3,7,8,9-hexachlorodibenzofuran	14	ND (3)	
1,2,3,4,6,7,8-heptachlorodibenzofuran	14	5	13
1,2,3,4,7,8,9-heptachlorodibenzofuran	14	ND (5)	
octachlorodibenzofuran	14	10	24

ND ... Not detected. Detection limits pg/g given in brackets ( ).

2,3,7,8–tetrachlorodibenzo–p–dioxin

recovery from soil precision & recovery samples



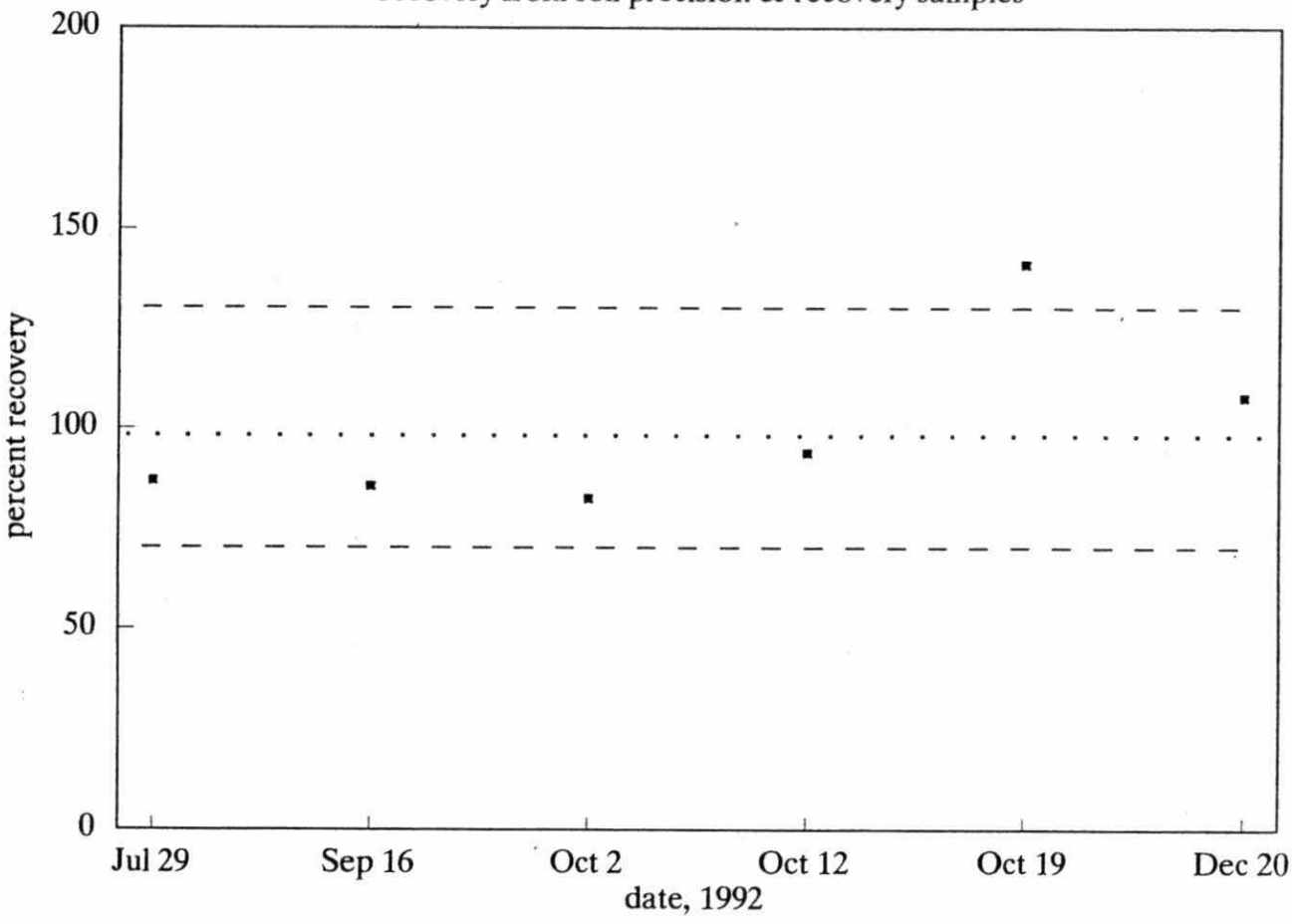
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table January - December 1992

Analyte	2,3,7,8-tetrachlorodibenzo-p-dioxin
True Concentration	460 pg/g
Number of Observations	6
Between-run Standard Deviation	28 %
Accuracy (% of expected)	98 %

1,2,3,7,8–pentachlorodibenzo–p–dioxin

recovery from soil precision & recovery samples



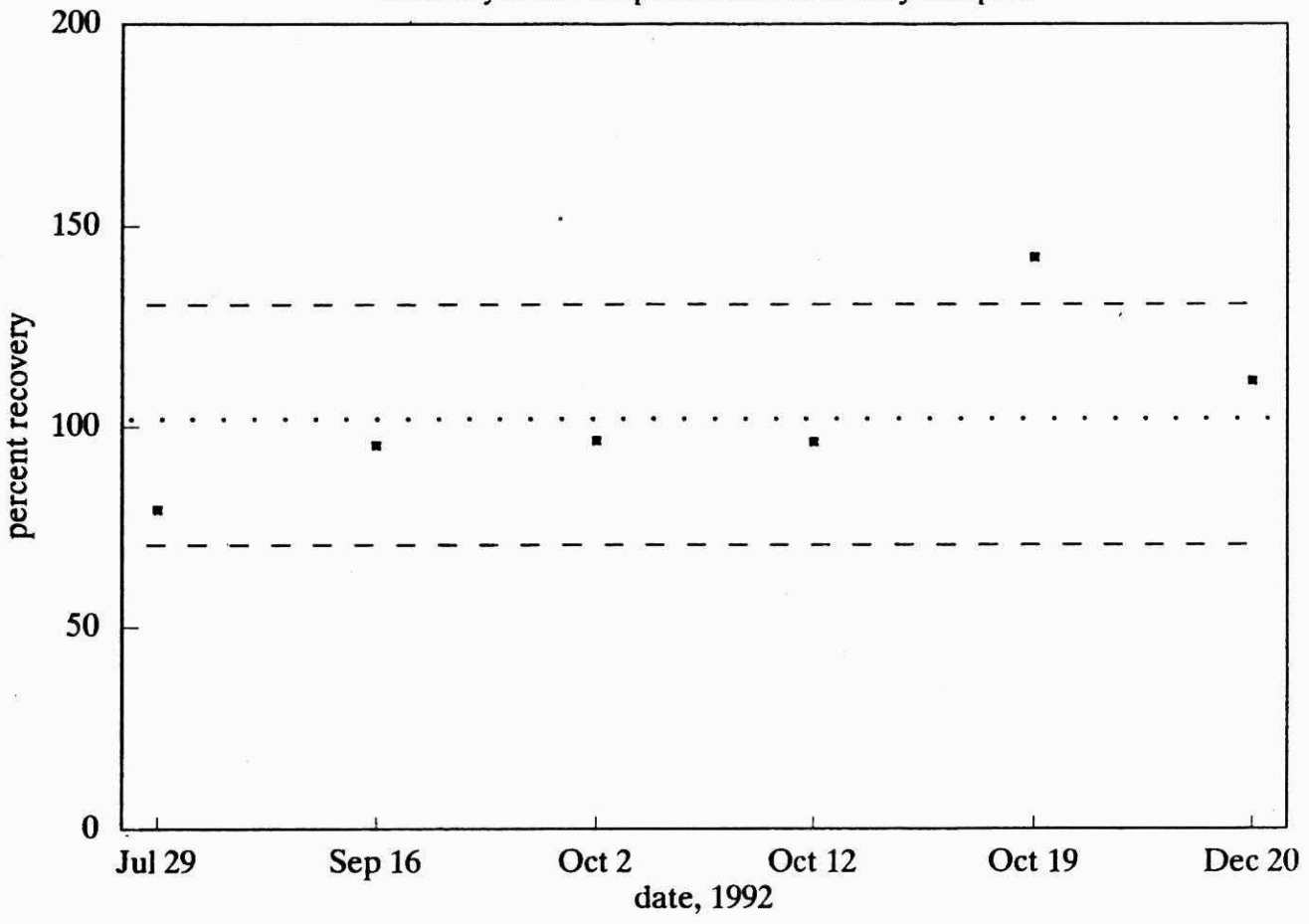
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table January - December 1992

Analyte	1,2,3,7,8-pentachlorodibenzo-p-dioxin
True Concentration	960 pg/g
Number of Observations	6
Between-run Standard Deviation	22 %
Accuracy (% of expected)	100 %

1,2,3,4,7,8–hexachlorodibenzo–p–dioxin

recovery from soil precision & recovery samples



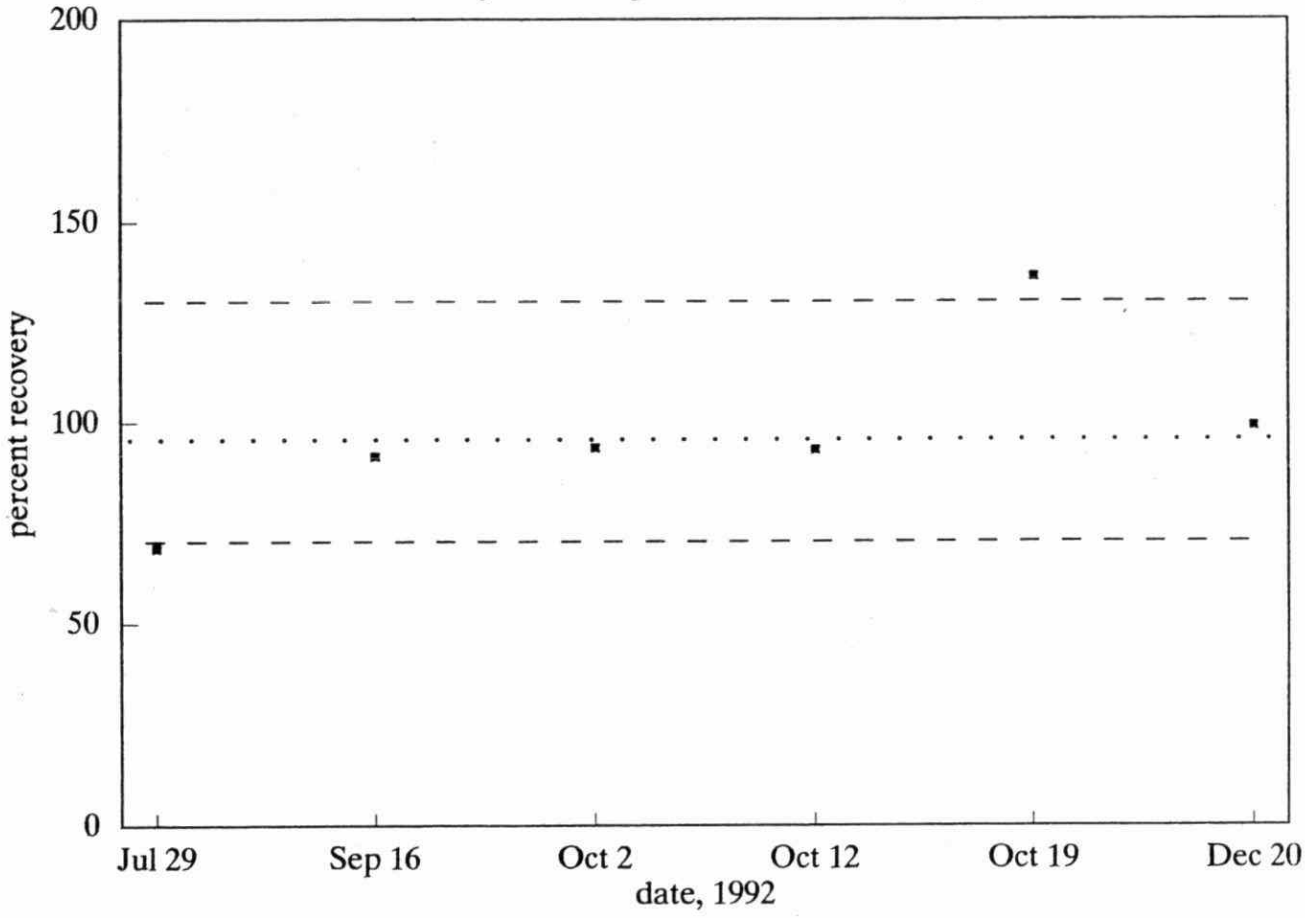
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,4,7,8-hexachlorodibenzo-p-dioxin
True Concentration	900 pg/g
Number of Observations	6
Between-run Standard Deviation	22 %
Accuracy (% of expected)	103 %

1,2,3,6,7,8–hexachlorodibenzo–p–dioxin

recovery from soil precision & recovery samples

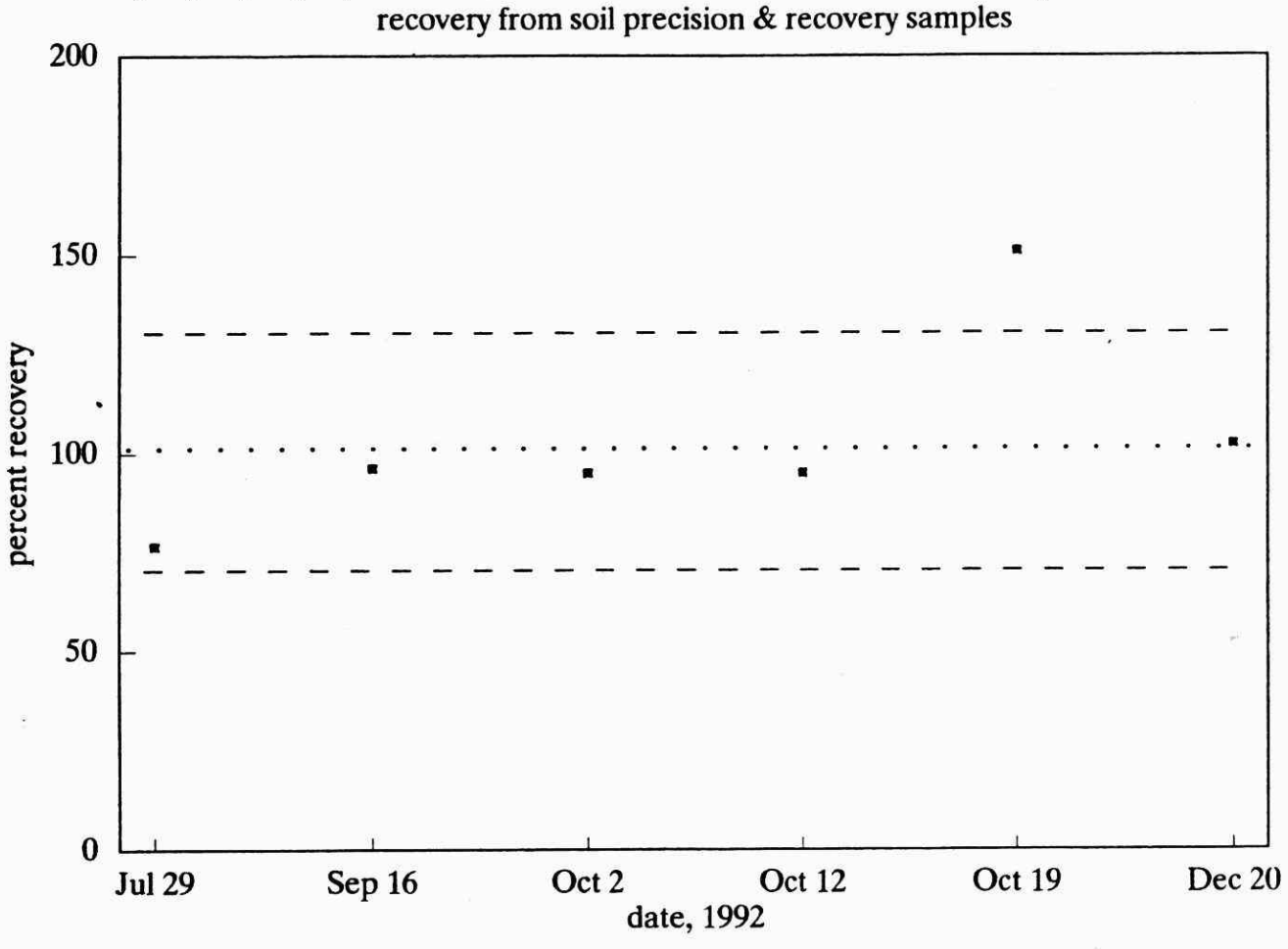


. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table January - December 1992

Analyte	1,2,3,6,7,8-hexachlorodibenzo-p-dioxin
True Concentration	870 pg/g
Number of Observations	6
Between-run Standard Deviation	22 %
Accuracy (% of expected)	97 %

1,2,3,7,8,9–hexachlorodibenzo–p–dioxin



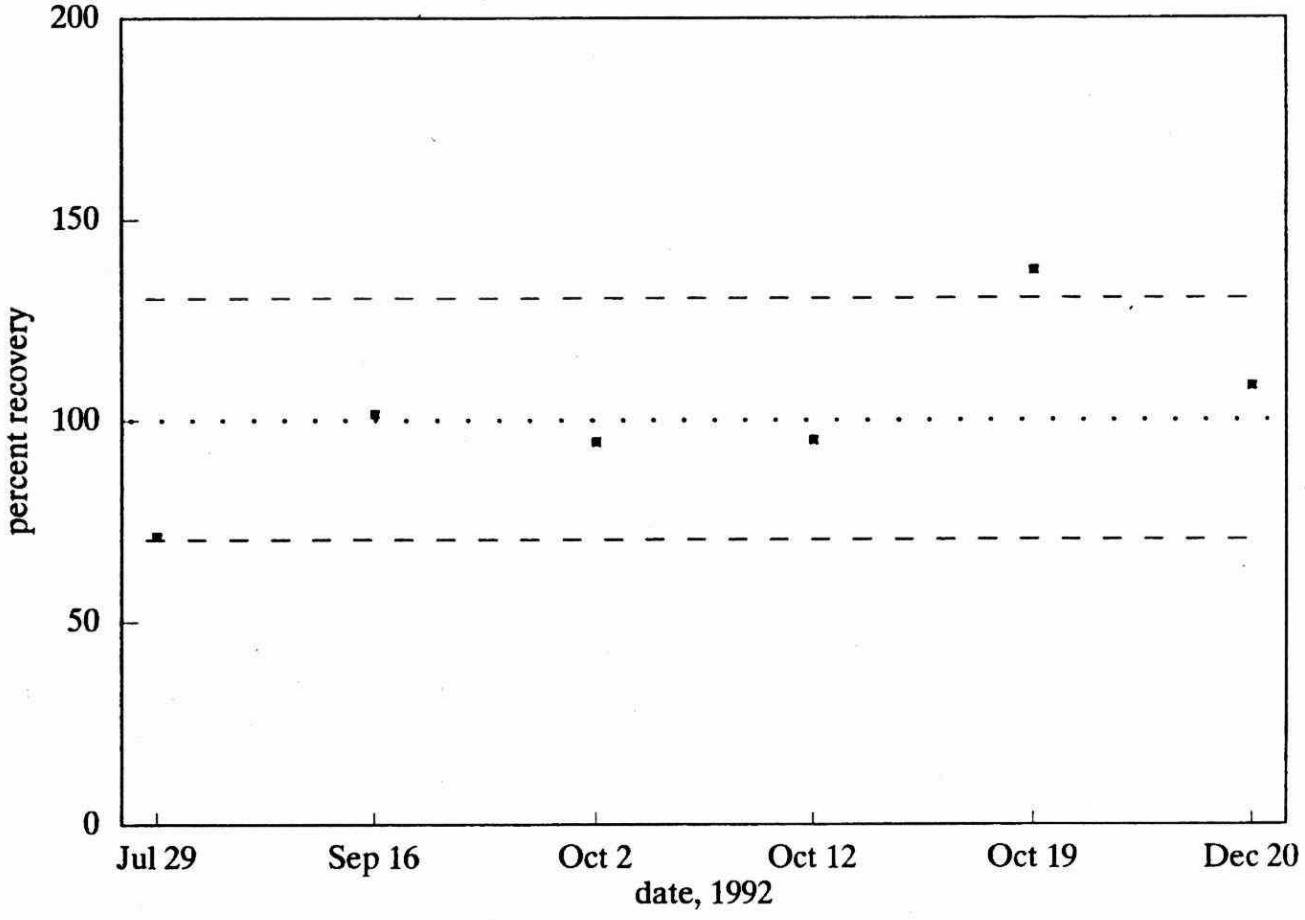
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table January - December 1992

Analyte	1,2,3,7,8,9-hexachlorodibenzo-p-dioxin
True Concentration	900 pg/g
Number of Observations	6
Between-run Standard Deviation	25 %
Accuracy (% of expected)	103 %

1,2,3,4,6,7,8–heptachlorodibenzo–p–dioxin

recovery from soil precision & recovery samples

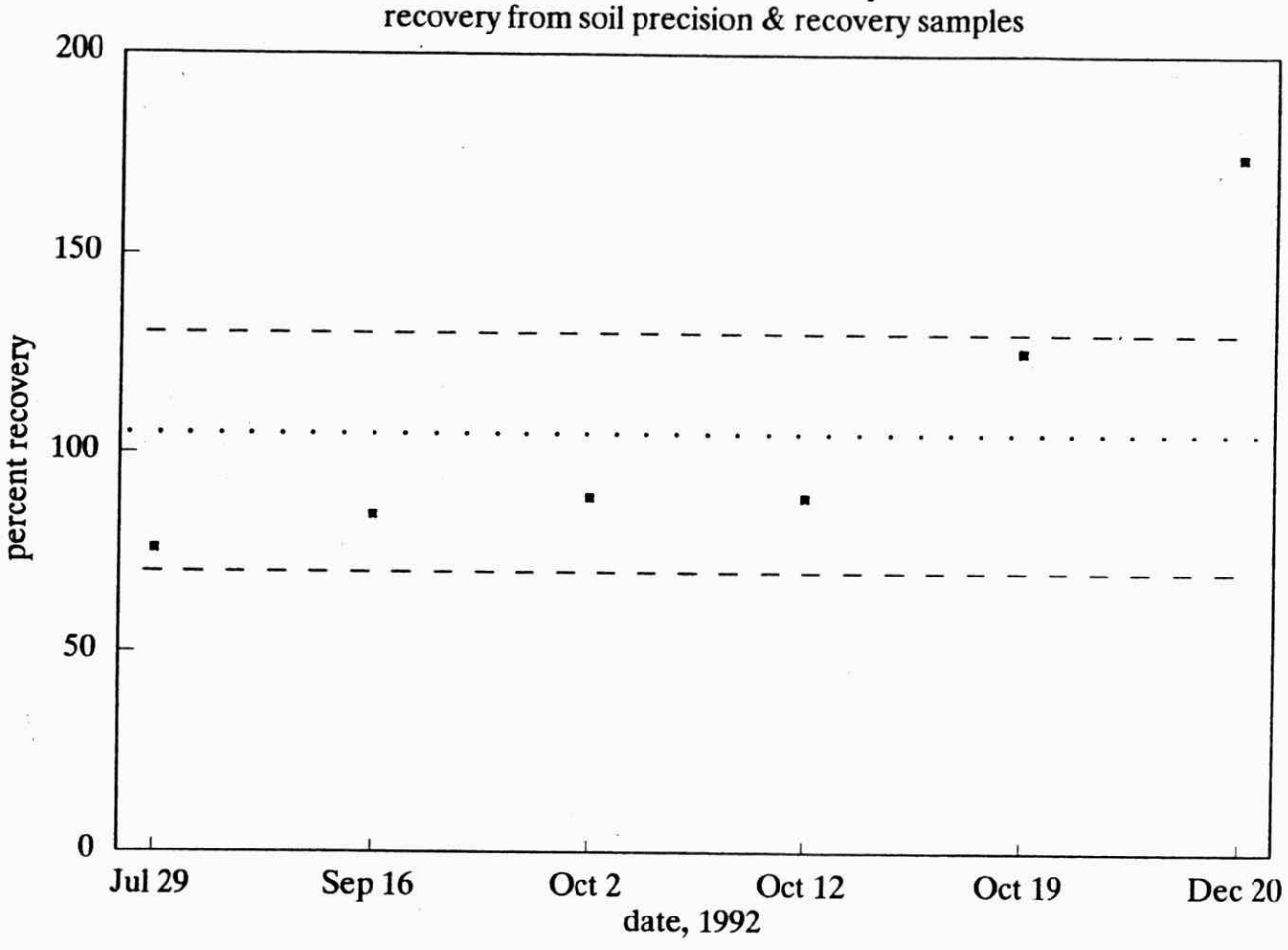


. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin
True Concentration	1390 pg/g
Number of Observations	6
Between-run Standard Deviation	22 %
Accuracy (% of expected)	101 %

octachlorodibenzo–p–dioxin



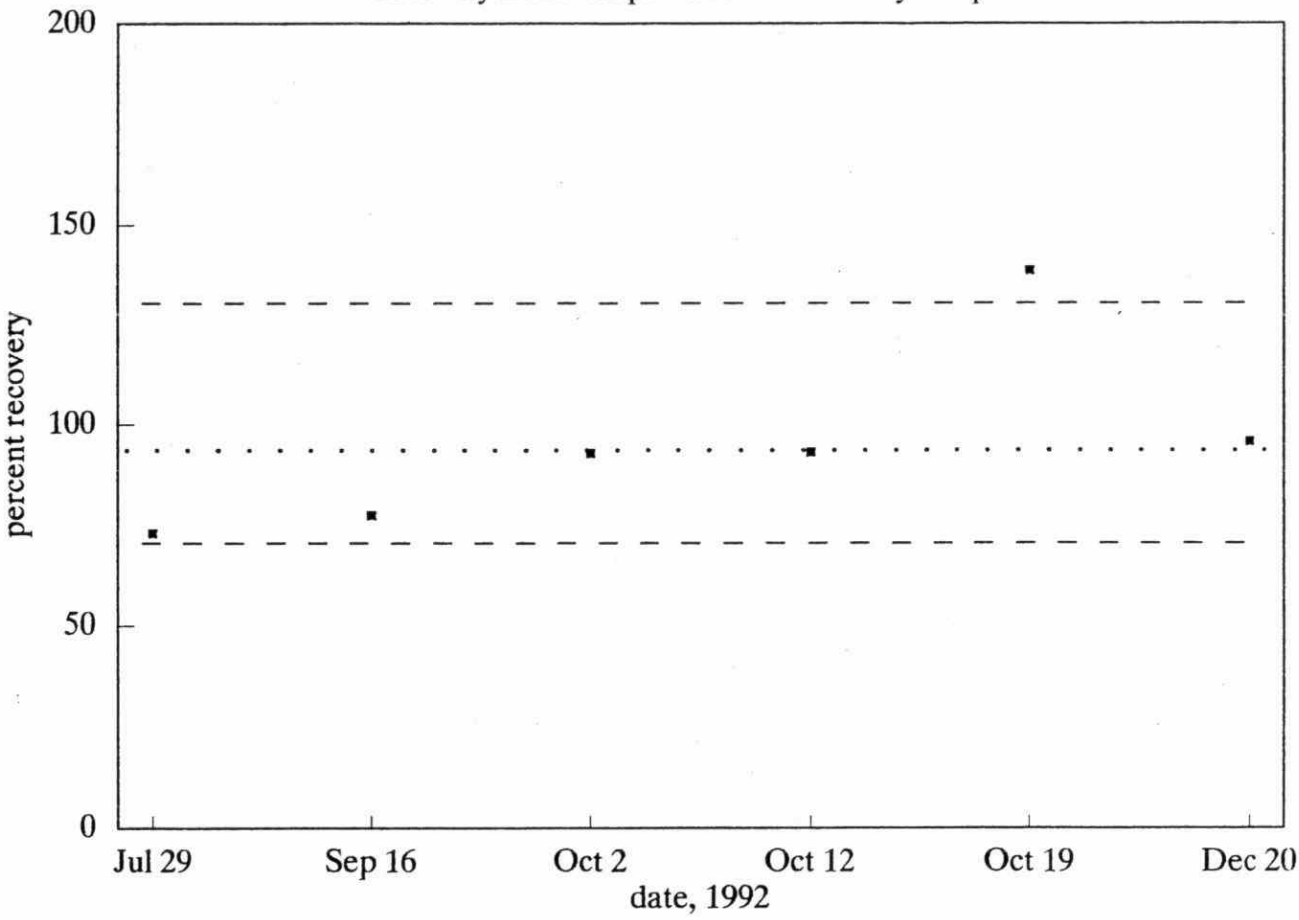
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table January - December 1992

Analyte	octachlorodibenzo-p-dioxin
True Concentration	3510 pg/g
Number of Observations	6
Between-run Standard Deviation	37 %
Accuracy (% of expected)	106 %

2,3,7,8–tetrachlorodibenzofuran

recovery from soil precision & recovery samples



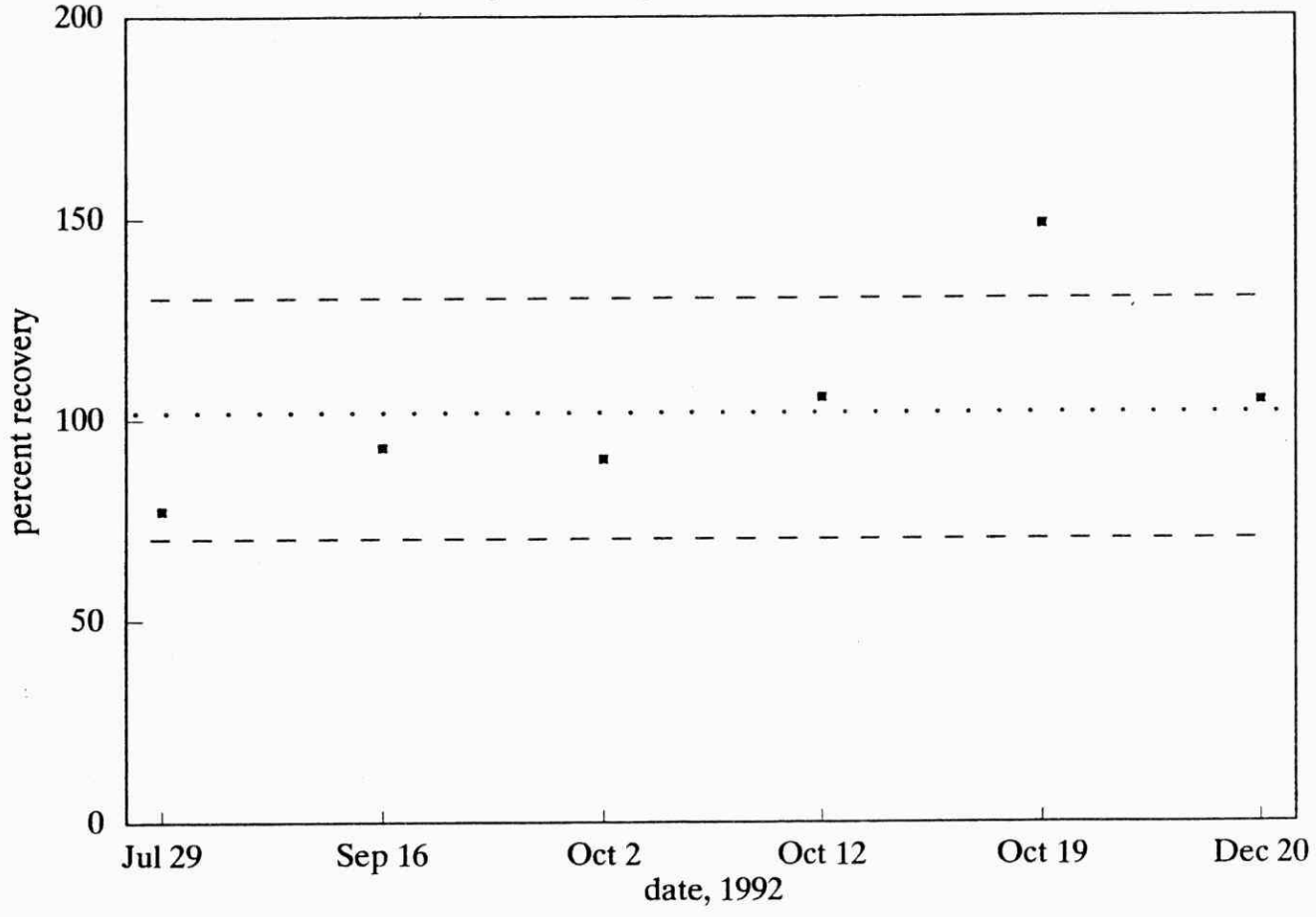
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	2,3,7,8-tetrachlorodibenzofuran
True Concentration	450 pg/g
Number of Observations	6
Between-run Standard Deviation	23 %
Accuracy (% of expected)	95 %

2,3,4,7,8–pentachlorodibenzofuran

recovery from soil precision & recovery samples



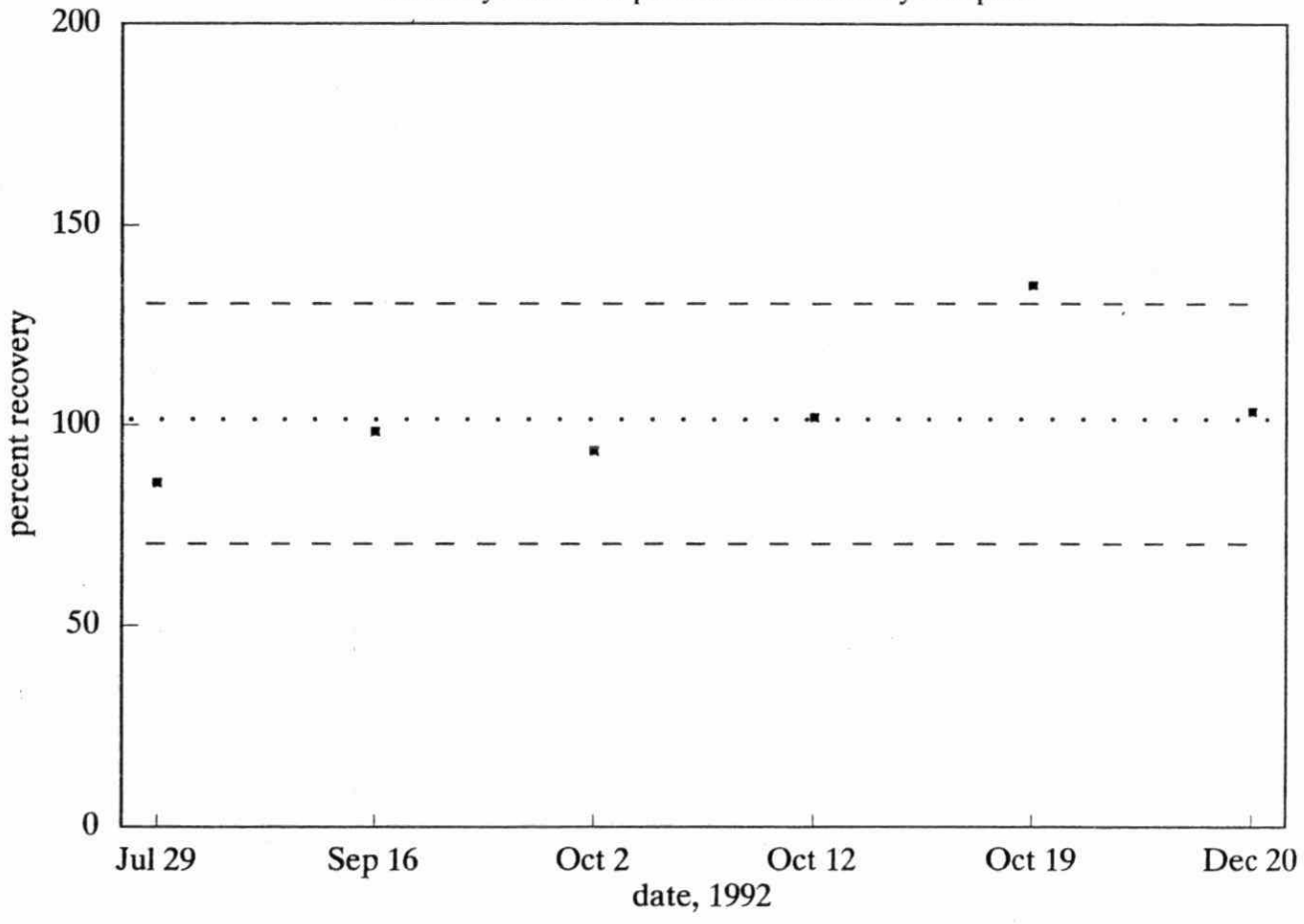
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	2,3,4,7,8-pentachlorodibenzofuran
True Concentration	870 pg/g
Number of Observations	6
Between-run Standard Deviation	25 %
Accuracy (% of expected)	103 %

1,2,3,7,8–pentachlorodibenzofuran

recovery from soil precision & recovery samples



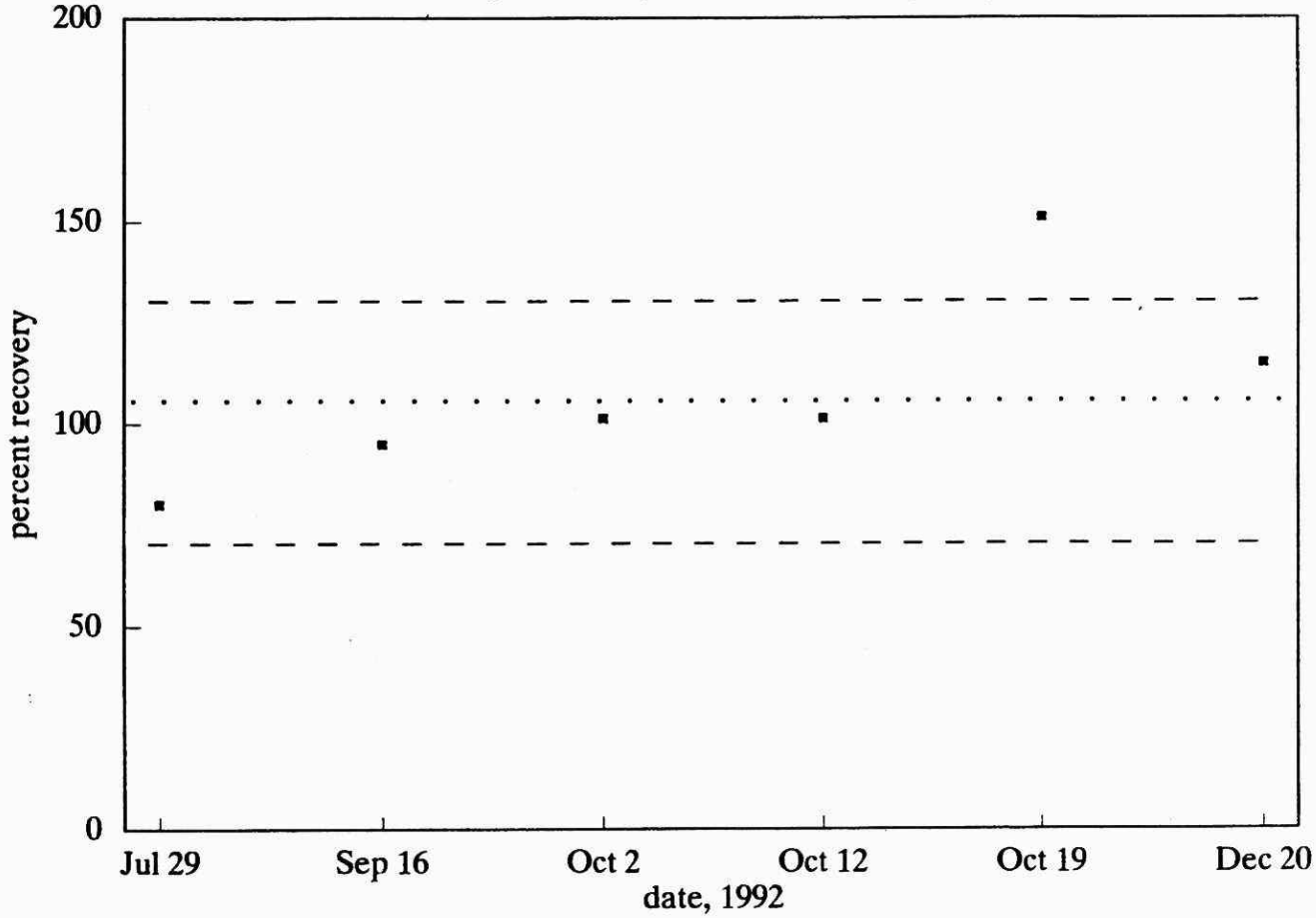
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,7,8-pentachlorodibenzofuran
True Concentration	860 pg/g
Number of Observations	6
Between-run Standard Deviation	17 %
Accuracy (% of expected)	103 %

1,2,3,4,7,8–hexachlorodibenzofuran

recovery from soil precision & recovery samples



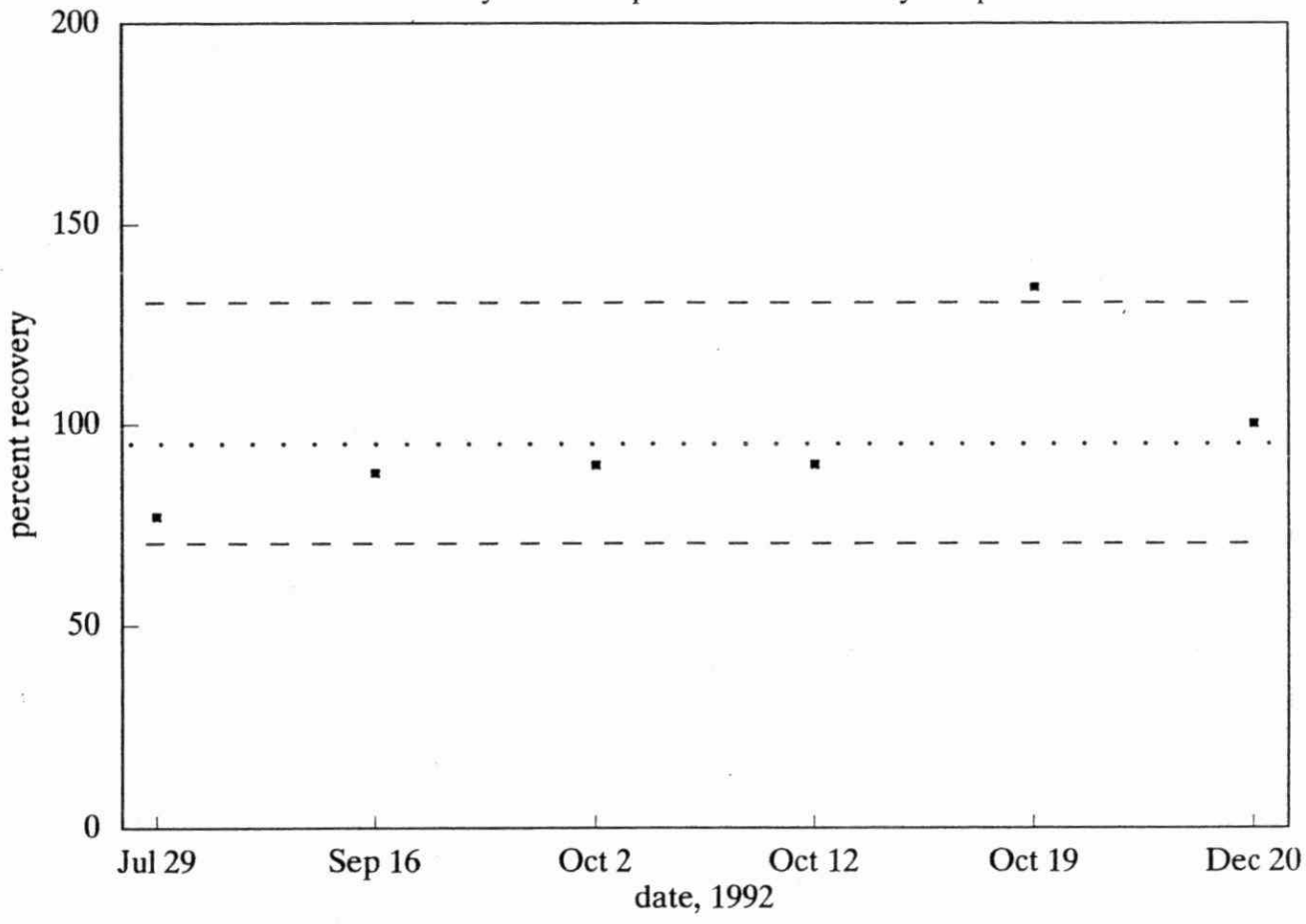
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,4,7,8-hexachlorodibenzofuran
True Concentration	880 pg/g
Number of Observations	6
Between-run Standard Deviation	24 %
Accuracy (% of expected)	107 %

1,2,3,6,7,8–hexachlorodibenzofuran

recovery from soil precision & recovery samples



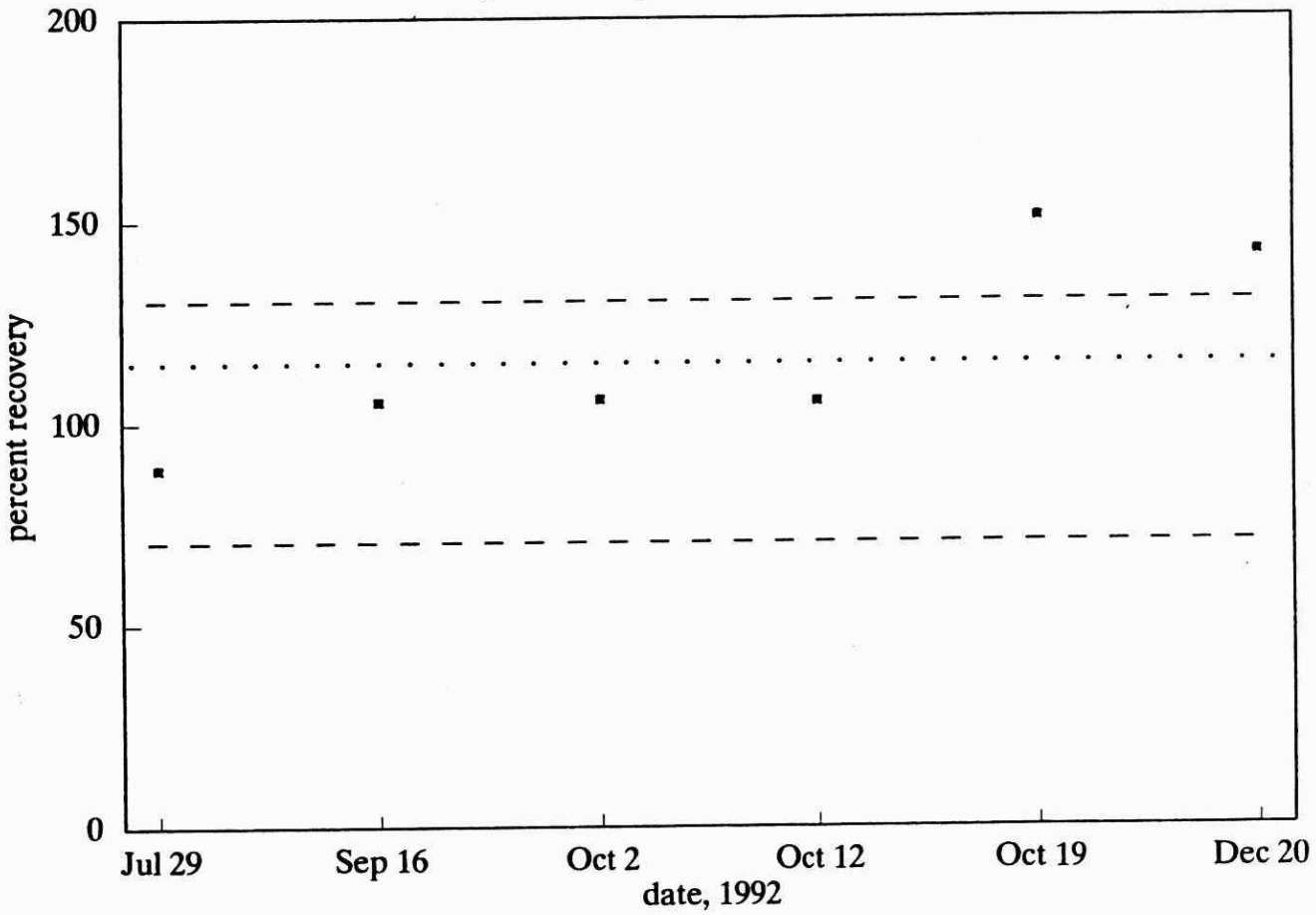
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,6,7,8-hexachlorodibenzofuran
True Concentration	950 pg/g
Number of Observations	6
Between-run Standard Deviation	20 %
Accuracy (% of expected)	97 %

2,3,4,6,7,8–hexachlorodibenzofuran

recovery from soil precision & recovery samples



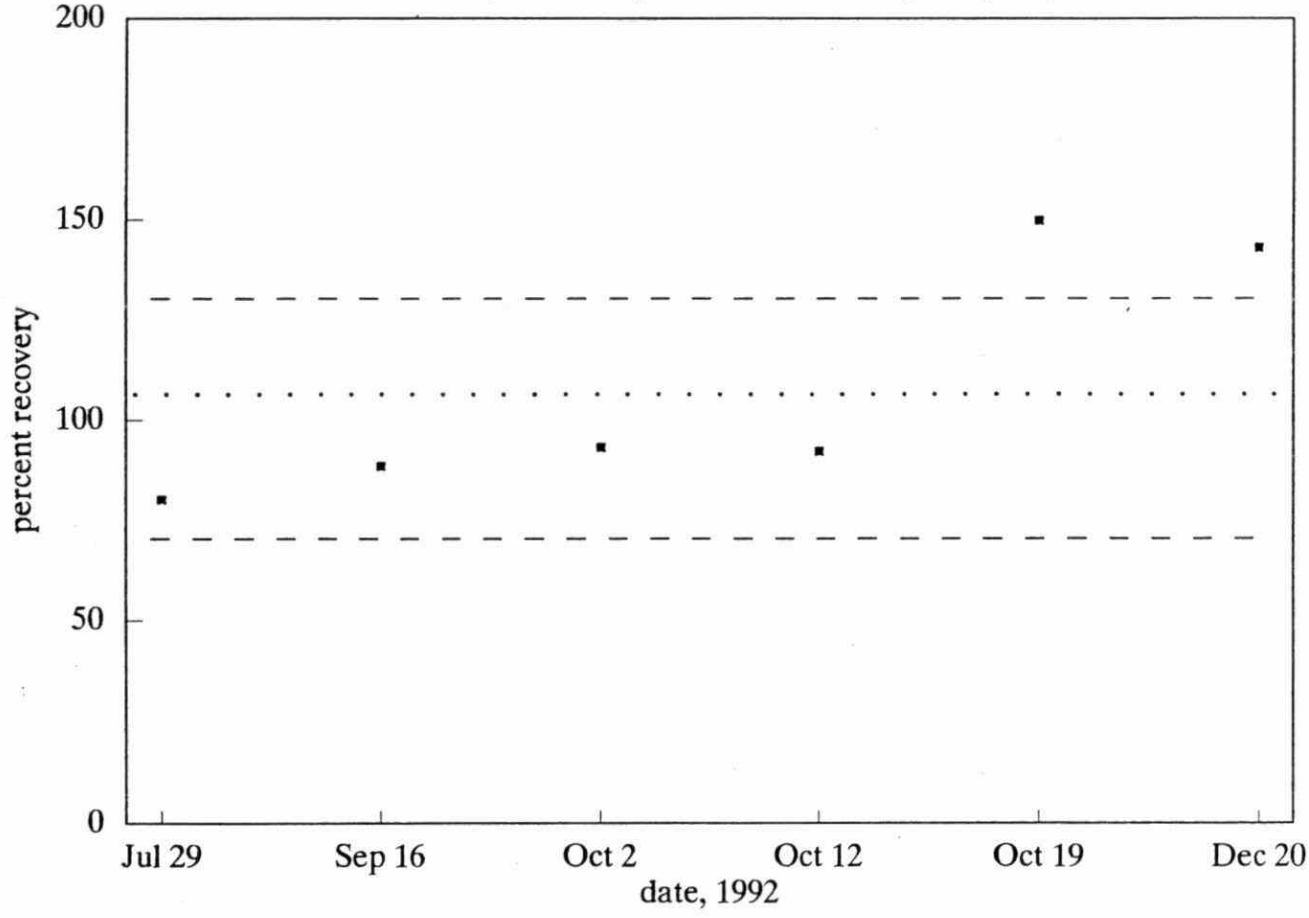
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	2,3,4,6,7,8-hexachlorodibenzofuran
True Concentration	820 pg/g
Number of Observations	6
Between-run Standard Deviation	24 %
Accuracy (% of expected)	116 %

1,2,3,7,8,9–hexachlorodibenzofuran

recovery from soil precision & recovery samples



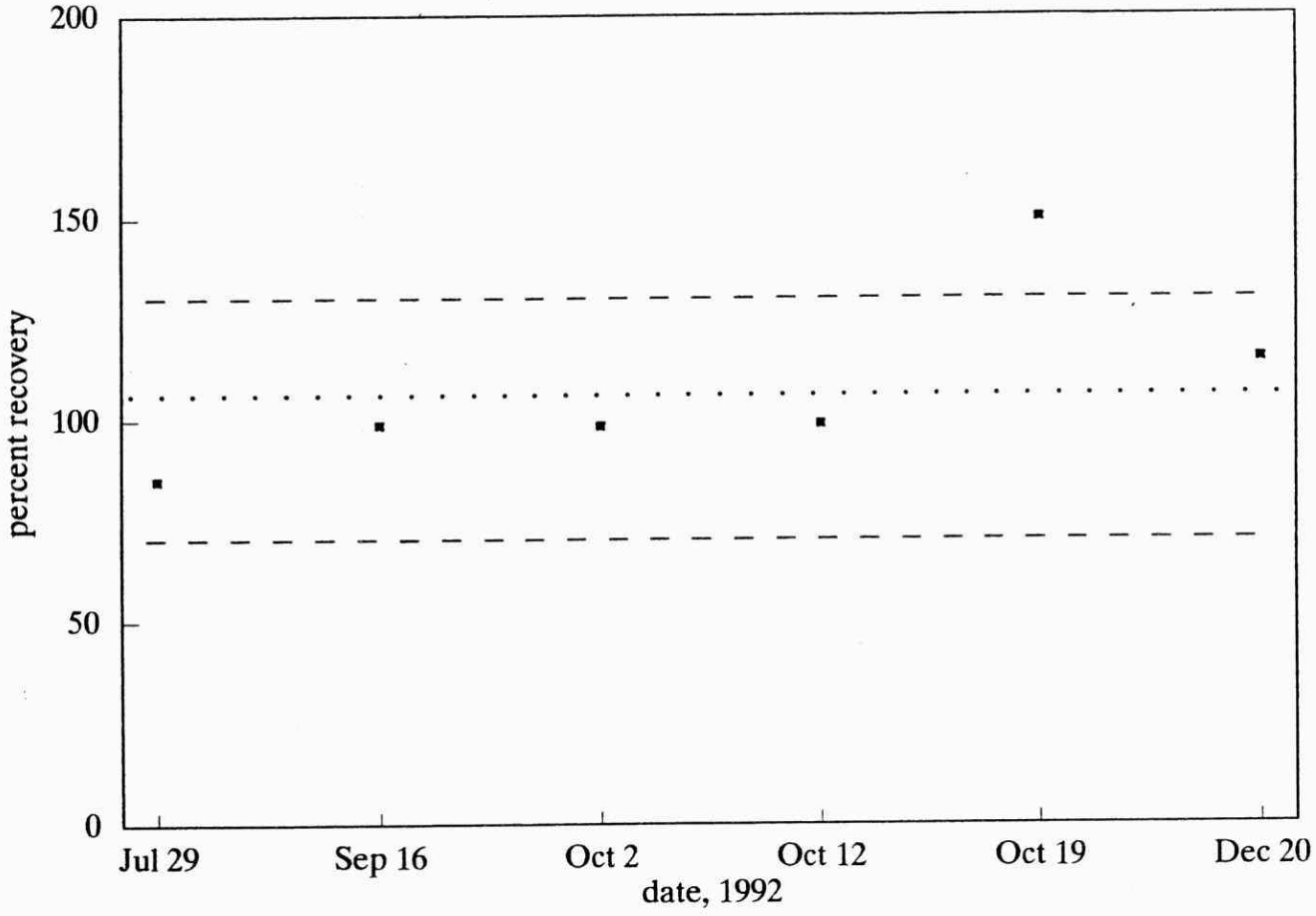
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table January - December 1992

Analyte	1,2,3,7,8,9-hexachlorodibenzofuran
True Concentration	910 pg/g
Number of Observations	6
Between-run Standard Deviation	30 %
Accuracy (% of expected)	108 %

1,2,3,4,6,7,8–heptachlorodibenzofuran

recovery from soil precision & recovery samples



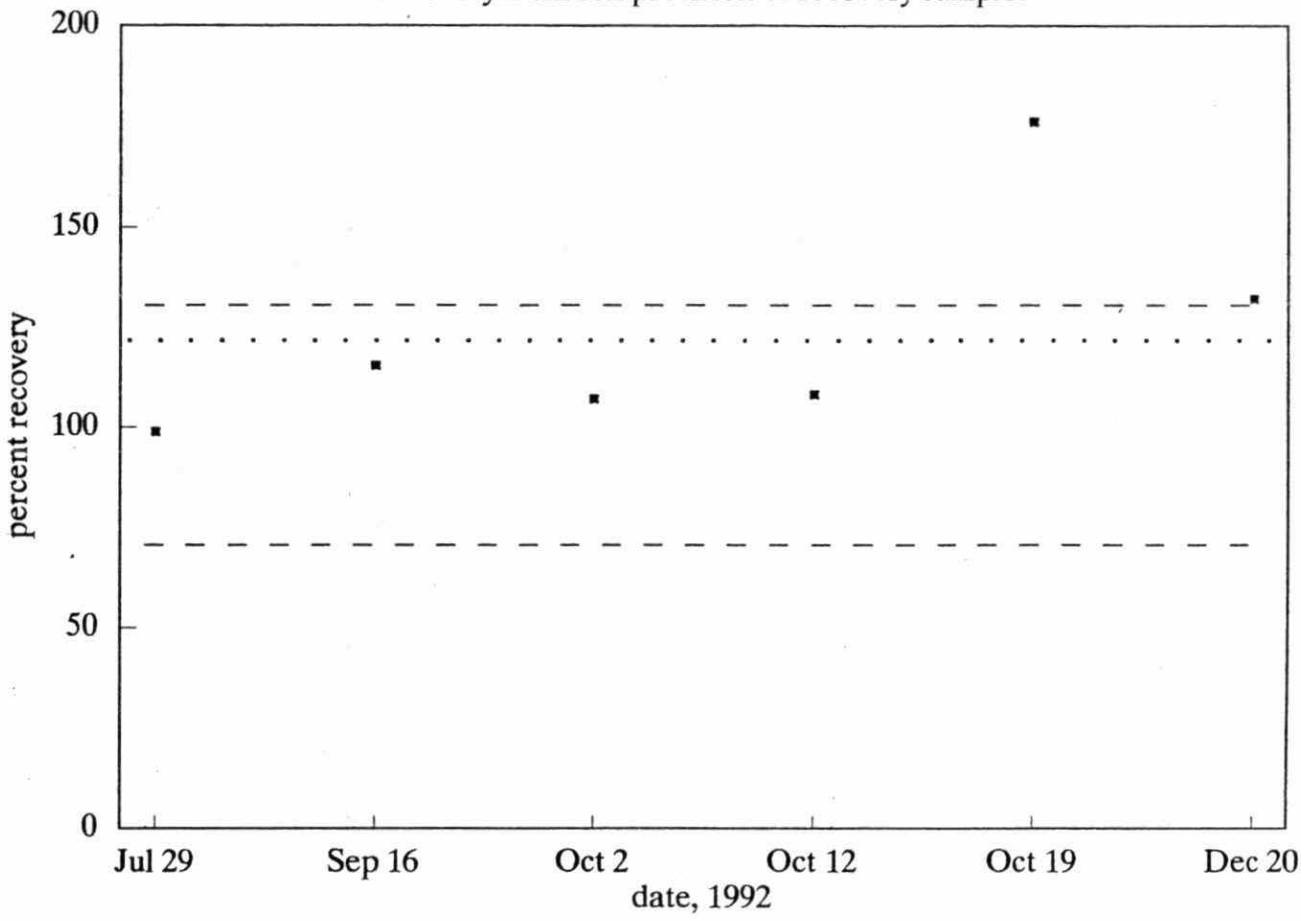
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table January - December 1992

Analyte	1,2,3,4,6,7,8-heptachlorodibenzofuran
True Concentration	1270 pg/g
Number of Observations	6
Between-run Standard Deviation	23 %
Accuracy (% of expected)	108 %

1,2,3,4,7,8,9–heptachlorodibenzofuran

recovery from soil precision & recovery samples



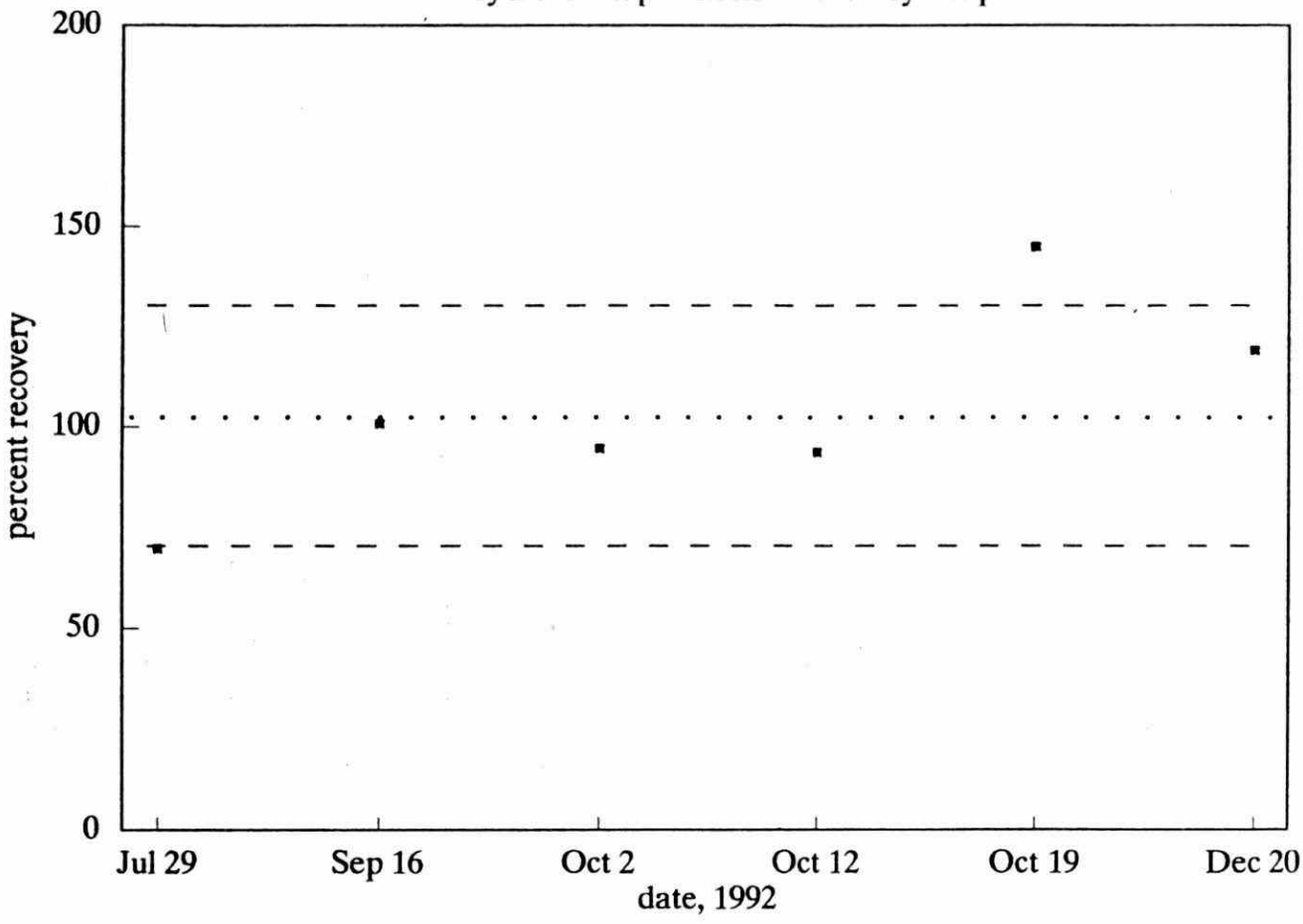
. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,4,7,8,9-heptachlorodibenzofuran
True Concentration	1120 pg/g
Number of Observations	6
Between-run Standard Deviation	28 %
Accuracy (% of expected)	123 %

octachlorodibenzofuran

recovery from soil precision & recovery samples



. . . . . average recovery (% of expected)
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	octachlorodibenzofuran
True Concentration	2250 pg/g
Number of Observations	6
Between-run Standard Deviation	26 %
Accuracy (% of expected)	104 %

METHOD CODE : PWAFD-E3163B
METHOD TITLE: The Determination of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans in Drinking Water by GC-MS

LABORATORY : Dioxin Unit
SUPERVISOR : Dr. E. Reiner

SAMPLE TYPE : raw or treated drinking water

PRINCIPLE OF THE METHOD :

A known quantity of isotopically labelled PCDDs and PCDFs is added to each sample to serve as an internal standard. Samples are filtered if they contain particulates. The particulate portion is solid/liquid extracted using a Soxhlet extractor, while the aqueous portion is liquid/liquid extracted. The extracts are re-combined before cleanup. A multi-stage chromatographic cleanup procedure is used to remove potential chemical interferences.

The reconstituted final extract is examined by gas chromatography - high resolution mass spectrometry (GC-HRMS) or gas chromatography/tandem mass spectrometry (GC-MS-MS).

PARAMETERS MEASURED :	**IDL (pg/L)**
2,3,7,8-tetrachlorodibenzo-p-dioxin	3
1,2,3,7,8-pentachlorodibenzo-p-dioxin	5
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	7
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	7
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	7
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	10
octachlorodibenzo-p-dioxin	10
2,3,7,8-tetrachlorodibenzofuran	5
2,3,4,7,8-pentachlorodibenzofuran	5
1,2,3,7,8-pentachlorodibenzofuran	5
1,2,3,4,7,8-hexachlorodibenzofuran	7
1,2,3,6,7,8-hexachlorodibenzofuran	7
2,3,4,6,7,8-hexachlorodibenzofuran	7
1,2,3,7,8,9-hexachlorodibenzofuran	7
1,2,3,4,6,7,8-heptachlorodibenzofuran	10
1,2,3,4,7,8,9-heptachlorodibenzofuran	10
octachlorodibenzofuran	10
total tetrachlorinated dibenzo-p-dioxins (TCDD)	
total pentachlorinated dibenzo-p-dioxins (PCDD)	
total hexachlorinated dibenzo-p-dioxins (HxCDD)	
total heptachlorinated dibenzo-p-dioxins (HpCDD)	
total tetrachlorinated dibenzofurans (TCDF)	
total pentachlorinated dibenzofurans (PCDF)	
total hexachlorinated dibenzofurans (HxCDF)	
total heptachlorinated dibenzofurans (HpCDF)	

REPORTING FORMAT :

Results are reported in parts per quadrillion (pg/L) rounded off to 2 significant figures. The minimum reported levels are sample and analyte specific * and range from 3 ppq to 10 ppq.

QUALITY CONTROL :

The routine quality control operations monitor overall method performance (precision and recovery samples), validity of calibration and consistency in injection volume (injection standard), absence of potential contamination (method blanks) and recovery of target analytes (internal quantitation standard).

List of Performance Tables : Method Blanks Summary

Method Blanks Summary January 1992 - December 1992

Analyte	Number of Observations	Average Concentration (pg/L)	Standard Deviation (pg/L)
2,3,7,8-tetrachlorodibenzo-p-dioxin	5	ND (3)	
1,2,3,7,8-pentachlorodibenzo-p-dioxin	5	ND (5)	
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	5	ND (7)	
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	5	ND (7)	
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	5	ND (7)	
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	5	ND (10)	
octachlorodibenzo-p-dioxin	5	1.7	3.3
2,3,7,8-tetrachlorodibenzofuran	5	ND (5)	
2,3,4,7,8-pentachlorodibenzofuran	5	ND (5)	
1,2,3,7,8-pentachlorodibenzofuran	5	ND (5)	
1,2,3,4,7,8-hexachlorodibenzofuran	5	ND (7)	
1,2,3,6,7,8-hexachlorodibenzofuran	5	ND (7)	
2,3,4,6,7,8-hexachlorodibenzofuran	5	ND (7)	
1,2,3,7,8,9-hexachlorodibenzofuran	5	ND (7)	
1,2,3,4,6,7,8-heptachlorodibenzofuran	5	ND (10)	
1,2,3,4,7,8,9-heptachlorodibenzofuran	5	ND (10)	
octachlorodibenzofuran	5	1.0	2.0

ND ... Not detected. Detection limit in pg/L given in brackets ( ).

* The minimum reported levels correspond to the amount of analyte that would give most-abundant ion response five times higher than corresponding instrumental noise.

METHOD CODE : PWAFD-E3164B
METHOD TITLE: The Determination of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans in Groundwater and Aqueous Effluent by GC-MS

LABORATORY : Dioxin Unit
SUPERVISOR : Dr. E. Reiner

SAMPLE TYPE : groundwater, aqueous industrial or municipal effluent

PRINCIPLE OF THE METHOD :

A known quantity of isotopically labelled PCDDs and PCDFs is added to each sample to serve as an internal quantitation standard. Sample is then filtered to separate the aqueous and particulate portions. The particulate portion is solid/liquid extracted using a Soxhlet extractor, while the aqueous portion is liquid/liquid extracted. The extracts are re-combined before cleanup. A multi-stage chromatographic cleanup procedure is used to remove potential chemical interferences.

The reconstituted final extract is examined by gas chromatography - high resolution mass spectrometry (GC-HRMS) or gas chromatography/tandem mass spectrometry (GC-MS-MS).

Further cleanup using high performance liquid chromatography (HPLC) may be necessary prior to final analysis if the sample is highly contaminated with chemical interferences that are not removed by the open-column chromatographic cleanup.

PARAMETERS MEASURED :	**IDL (pg/L)**	**MDL (pg/L)**
2,3,7,8-tetrachlorodibenzo-p-dioxin	3	3.9
1,2,3,7,8-pentachlorodibenzo-p-dioxin	5	15
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	7	11
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	7	15
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	7	28
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	10	21
octachlorodibenzo-p-dioxin	10	72
2,3,7,8-tetrachlorodibenzofuran	5	21
2,3,4,7,8-pentachlorodibenzofuran	5	19
1,2,3,7,8-pentachlorodibenzofuran	5	21
1,2,3,4,7,8-hexachlorodibenzofuran	7	15
1,2,3,6,7,8-hexachlorodibenzofuran	7	11
2,3,4,6,7,8-hexachlorodibenzofuran	7	22
1,2,3,7,8,9-hexachlorodibenzofuran	7	15
1,2,3,4,6,7,8-heptachlorodibenzofuran	10	28
1,2,3,4,7,8,9-heptachlorodibenzofuran	10	20
octachlorodibenzofuran	10	35

(Parameters Measured continued)

total tetrachlorinated dibenzo-p-dioxins (TCDD)
total pentachlorinated dibenzo-p-dioxins (PCDD)
total hexachlorinated dibenzo-p-dioxins (HxCDD)
total heptachlorinated dibenzo-p-dioxins (HpCDD)
total tetrachlorinated dibenzofurans (TCDF)
total pentachlorinated dibenzofurans (PCDF)
total hexachlorinated dibenzofurans (HxCDF)
total heptachlorinated dibenzofurans (HpCDF)

REPORTING FORMAT :

Results are reported in parts per quadrillion (pg/L) rounded off to 2 significant figures. The minimum reported levels are sample and analyte specific * and range from 5 ppq to 10 ppq.

QUALITY CONTROL :

The routine quality control operations monitor overall method performance (precision and recovery samples), validity of calibration and consistency in injection volume (injection standard), absence of potential contamination (method blanks) and recovery of target analytes (internal quantitation standard).

REMARKS : Two types of performance limits are displayed on the performance charts. One set was statistically derived from the 1992 data; while the other (established at recoveries of 70% and 130%) was adopted by the Dioxin Unit as the method performance control limits.

List of Performance Charts and Tables:

Method Blanks Summary
2,3,7,8-tetrachlorodibenzo-p-dioxin
1,2,3,7,8-pentachlorodibenzo-p-dioxin
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin
octachlorodibenzo-p-dioxin
2,3,7,8-tetrachlorodibenzofuran
2,3,4,7,8-pentachlorodibenzofuran
1,2,3,7,8-pentachlorodibenzofuran
1,2,3,4,7,8-hexachlorodibenzofuran
1,2,3,6,7,8-hexachlorodibenzofuran
2,3,4,6,7,8-hexachlorodibenzofuran

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* The minimum reported levels correspond to the amount of analyte that would give most-abundant ion response five times higher than corresponding instrumental noise.

(List of Performance Charts and Tables continued)

1,2,3,7,8,9-hexachlorodibenzofuran
1,2,3,4,6,7,8-heptachlorodibenzofuran
1,2,3,4,7,8,9-heptachlorodibenzofuran
octachlorodibenzofuran

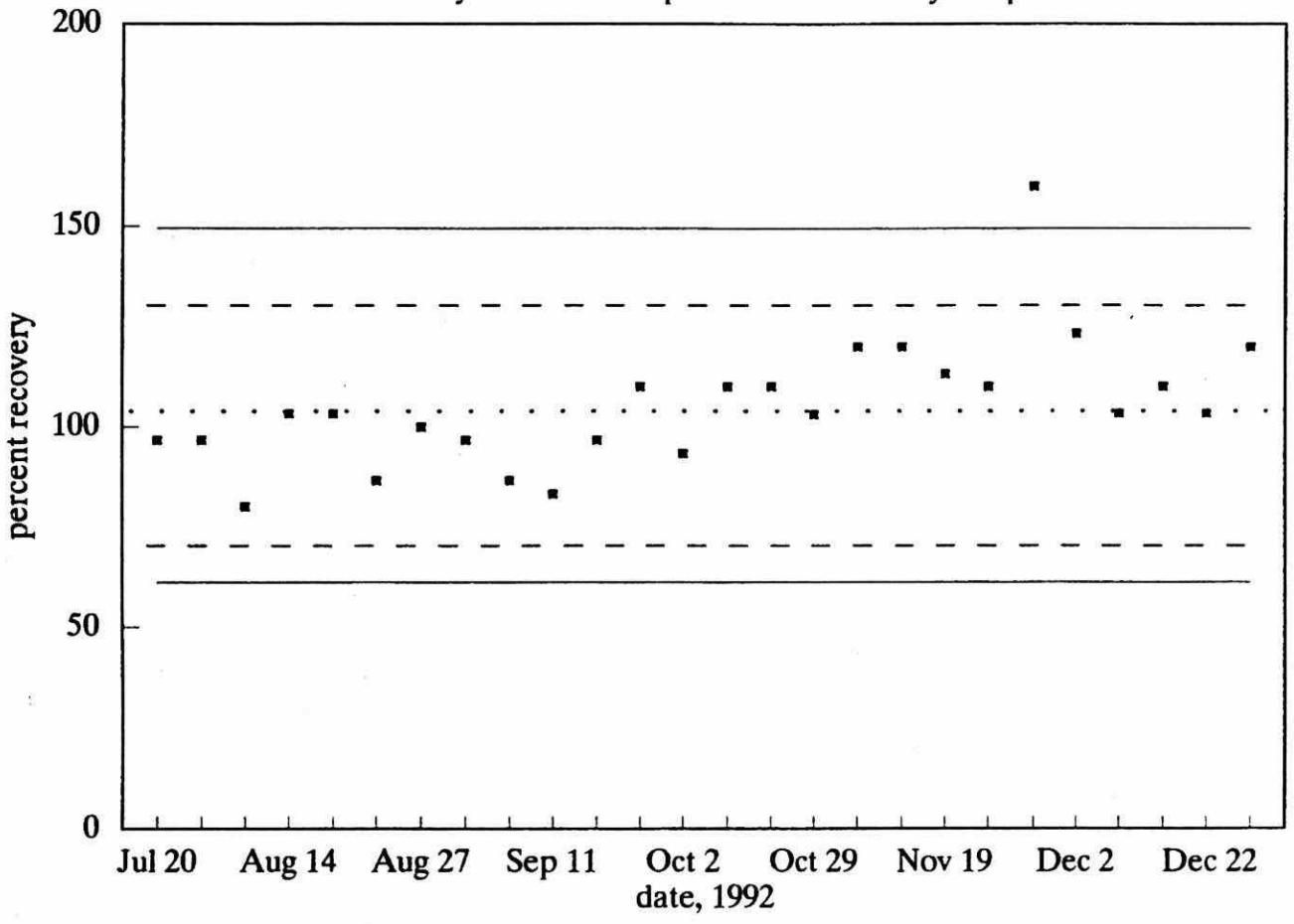
Method Blanks Summary January 1992 - December 1992

Analyte	Number of Observations	Average Concentration (pg/L)	Standard Deviation (pg/L)
2,3,7,8-tetrachlorodibenzo-p-dioxin	38	0.011	0.06
1,2,3,7,8-pentachlorodibenzo-p-dioxin	38	ND (5)	
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	38	ND (7)	
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	38	ND (7)	
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	38	ND (7)	
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	38	0.04	0.26
octachlorodibenzo-p-dioxin	38	1.1	2.9
2,3,7,8-tetrachlorodibenzofuran	38	ND (5)	
2,3,4,7,8-pentachlorodibenzofuran	38	ND (5)	
1,2,3,7,8-pentachlorodibenzofuran	38	ND (5)	
1,2,3,4,7,8-hexachlorodibenzofuran	38	ND (7)	
1,2,3,6,7,8-hexachlorodibenzofuran	38	ND (7)	
2,3,4,6,7,8-hexachlorodibenzofuran	38	0.04	0.25
1,2,3,7,8,9-hexachlorodibenzofuran	38	ND (7)	
1,2,3,4,6,7,8-heptachlorodibenzofuran	38	ND (10)	
1,2,3,4,7,8,9-heptachlorodibenzofuran	38	ND (10)	
octachlorodibenzofuran	38	0.13	0.80

ND ... Not detected. Detection limits in pg/L given in brackets ( ).

2,3,7,8–tetrachlorodibenzo–p–dioxin

recovery from effluent precision & recovery samples



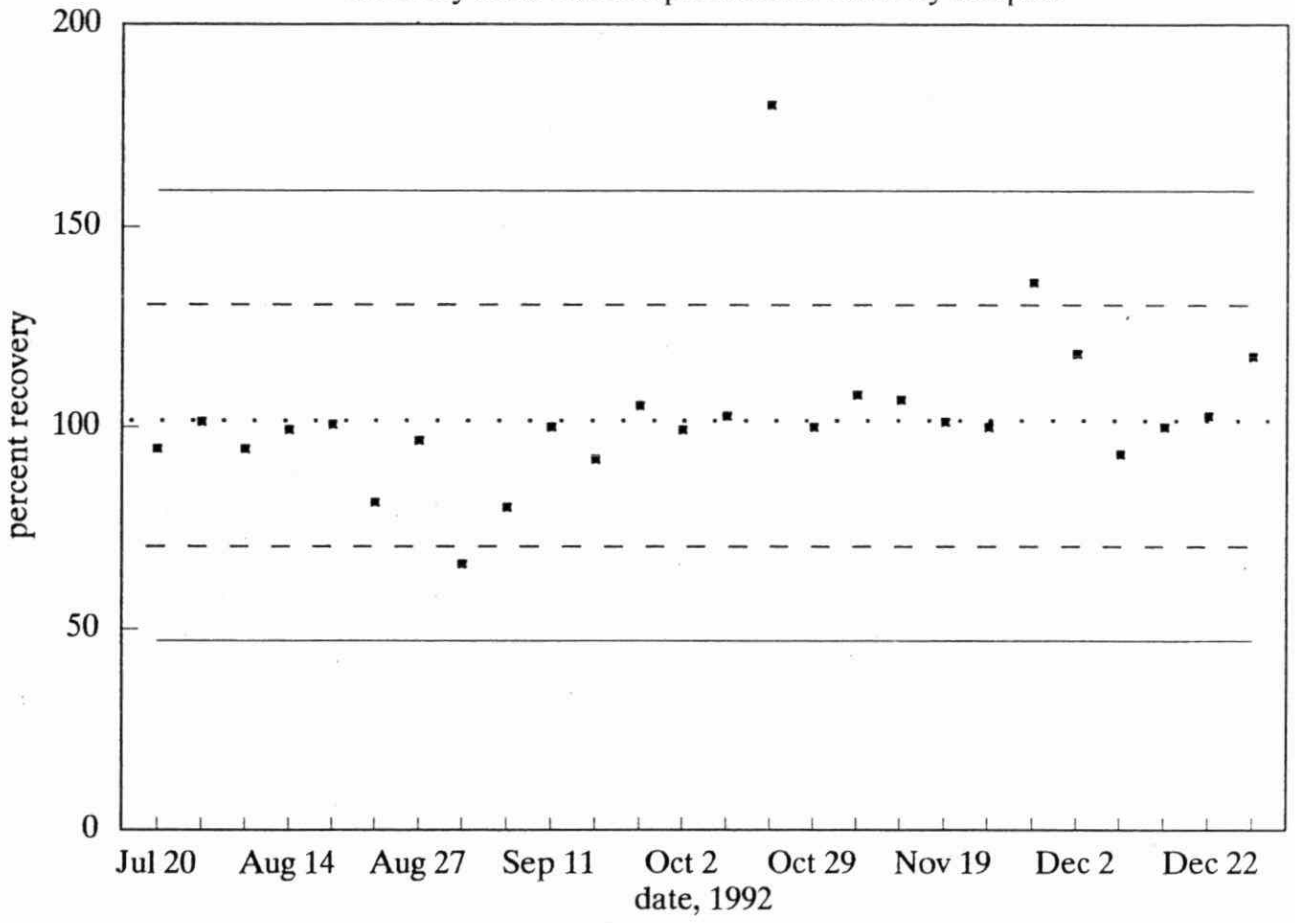
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	2,3,7,8-tetrachlorodibenzo-p-dioxin
True Concentration	30 pg/L
Number of Observations	26
Between-run Standard Deviation	16 %
Accuracy (% of expected)	105 %

1,2,3,7,8–pentachlorodibenzo–p–dioxin

recovery from effluent precision & recovery samples



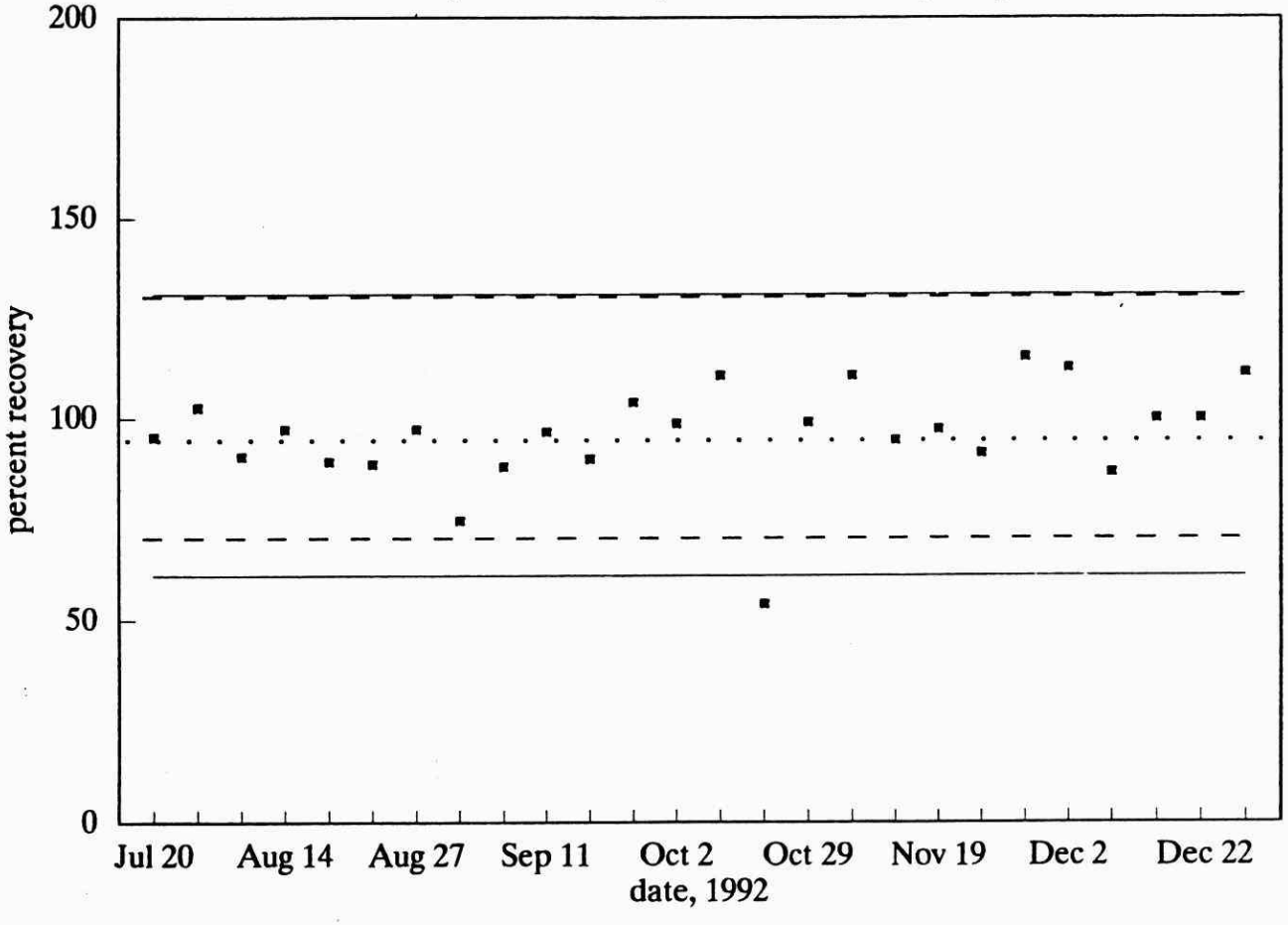
. . . . . average recovery (% of expected)
_____ 99% confidence limits
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,7,8-pentachlorodibenzo-p-dioxin
True Concentration	150 pg/L
Number of Observations	26
Between-run Standard Deviation	20 %
Accuracy (% of expected)	103 %

1,2,3,4,7,8–hexachlorodibenzo–p–dioxin

recovery from effluent precision & recovery samples



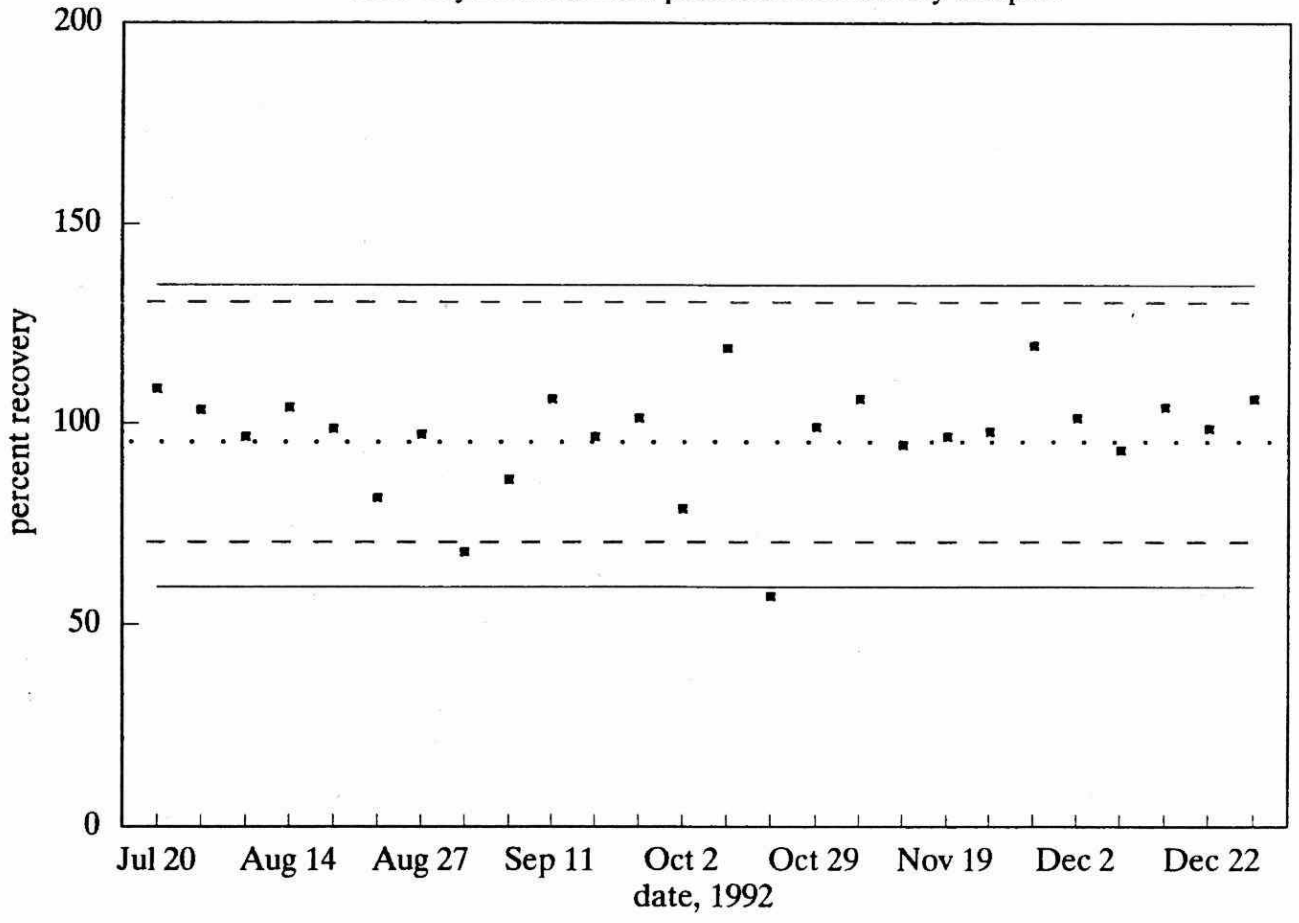
. . . . . average recovery (% of expected)
_____ 99% confidence limits
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,4,7,8-hexachlorodibenzo-p-dioxin
True Concentration	150 pg/L
Number of Observations	26
Between-run Standard Deviation	13 %
Accuracy (% of expected)	96 %

1,2,3,6,7,8–hexachlorodibenzo–p–dioxin

recovery from effluent precision & recovery samples



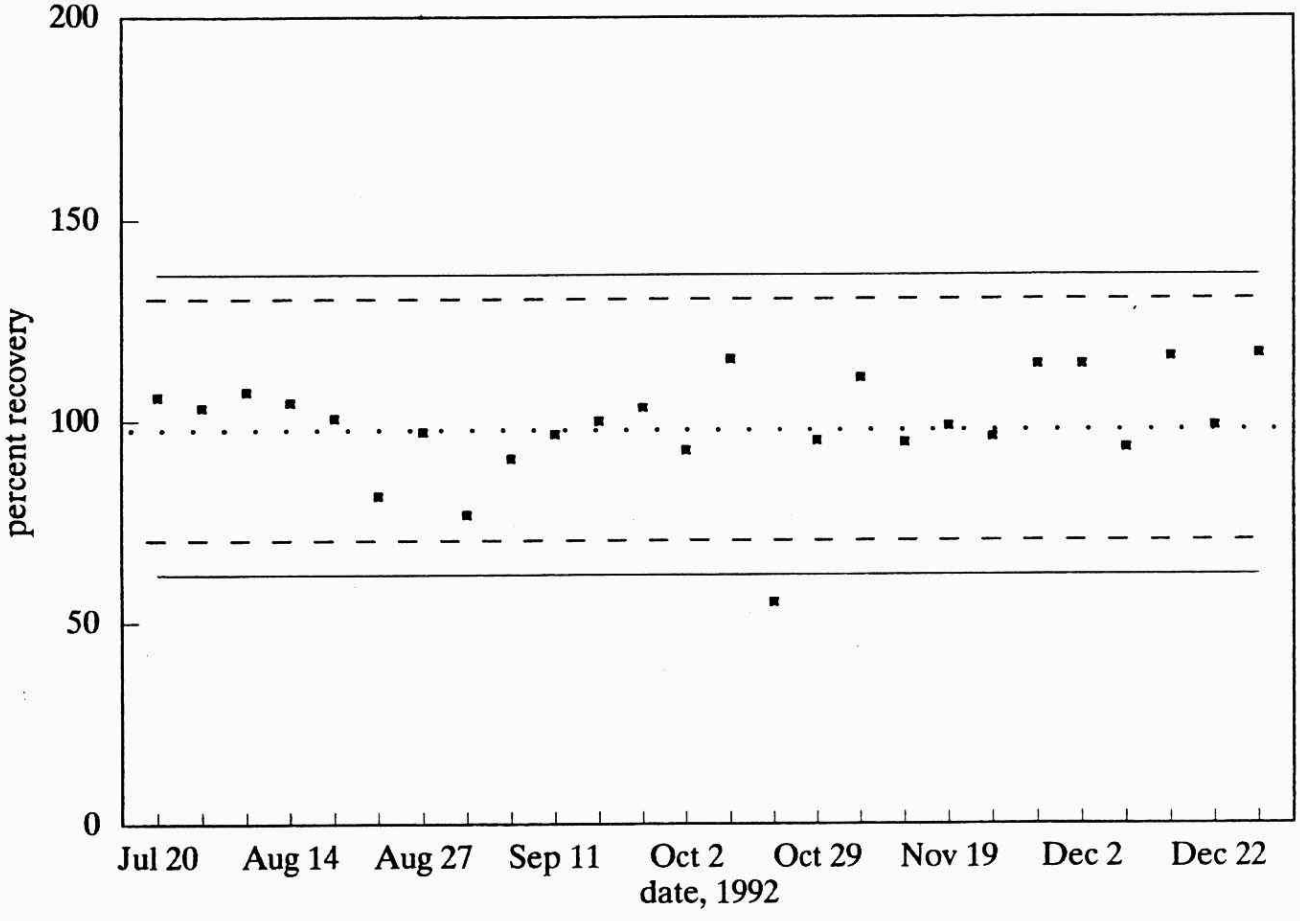
. . . . . average recovery (% of expected)
_____ 99% confidence limits
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,6,7,8-hexachlorodibenzo-p-dioxin
True Concentration	150 pg/L
Number of Observations	26
Between-run Standard Deviation	14 %
Accuracy (% of expected)	97 %

1,2,3,7,8,9–hexachlorodibenzo–p–dioxin

recovery from effluent precision & recovery samples



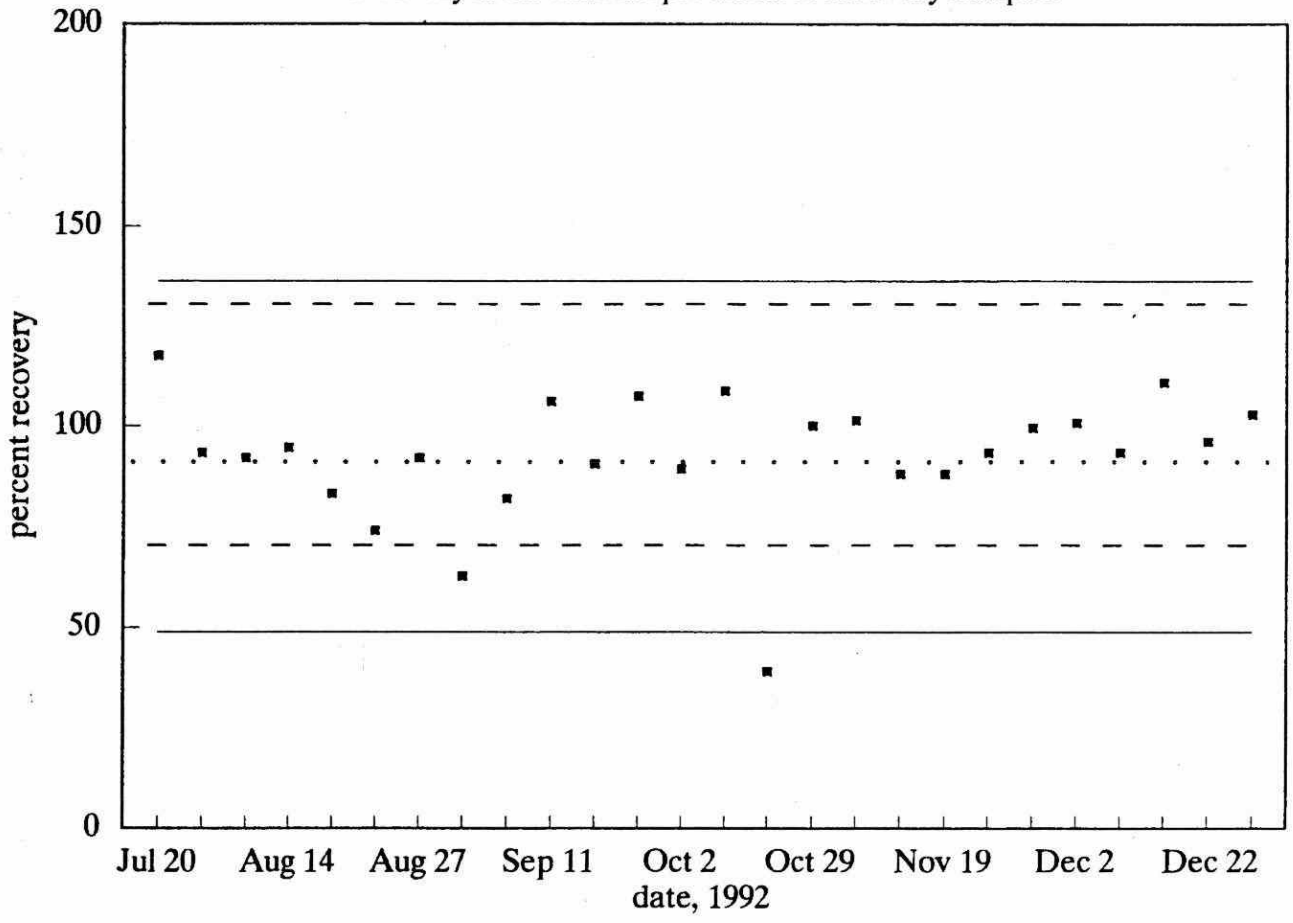
. . . . . average recovery (% of expected)
_____ 99% confidence limits
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,7,8,9-hexachlorodibenzo-p-dioxin
True Concentration	150 pg/L
Number of Observations	26
Between-run Standard Deviation	14 %
Accuracy (% of expected)	99 %

1,2,3,4,6,7,8–heptachlorodibenzo–p–dioxin

recovery from effluent precision & recovery samples



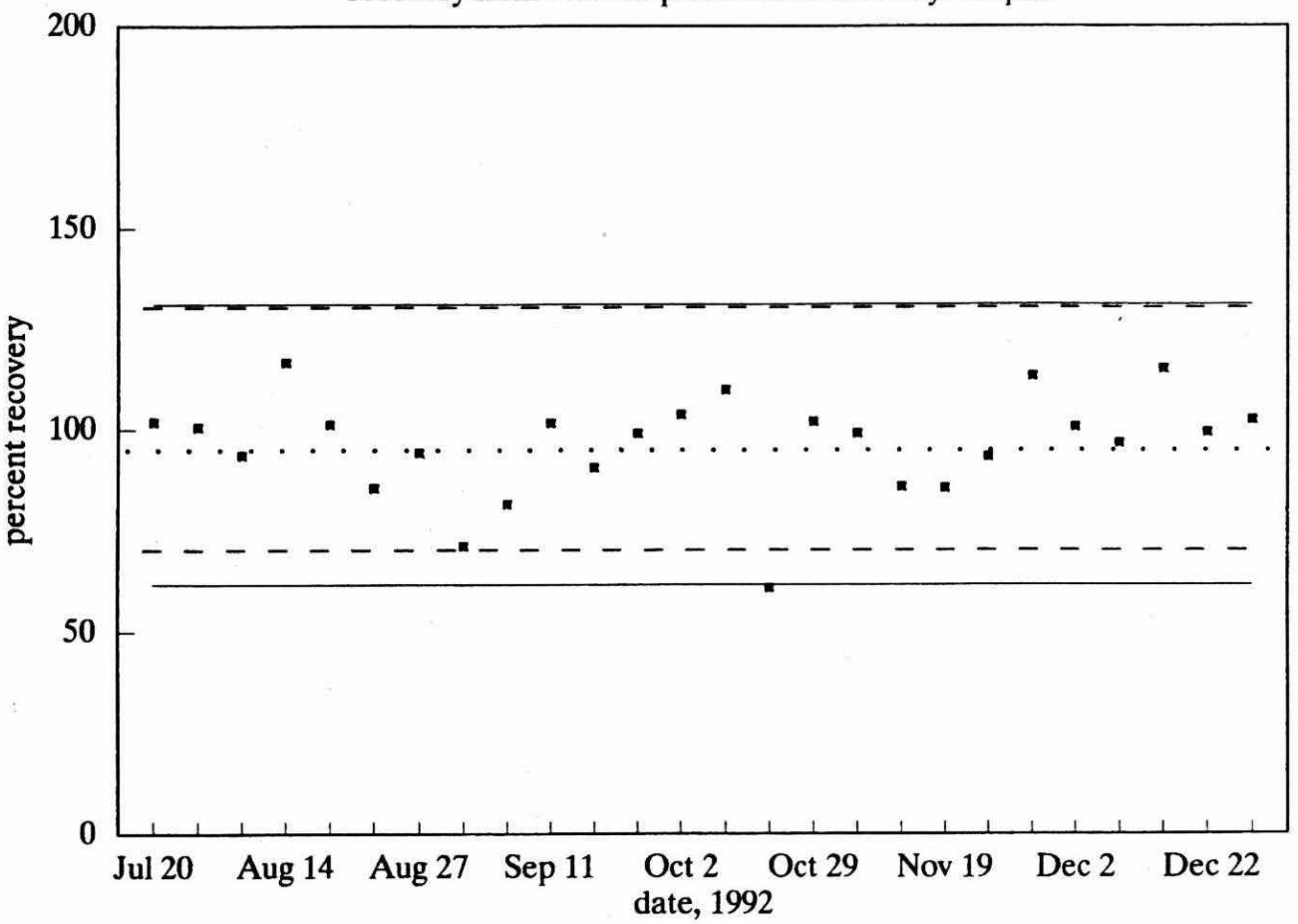
. . . . . average recovery (% of expected)
_____ 99% confidence limits
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin
True Concentration	150 pg/L
Number of Observations	26
Between-run Standard Deviation	16 %
Accuracy (% of expected)	93 %

octachlorodibenzo–p–dioxin

recovery from effluent precision & recovery samples



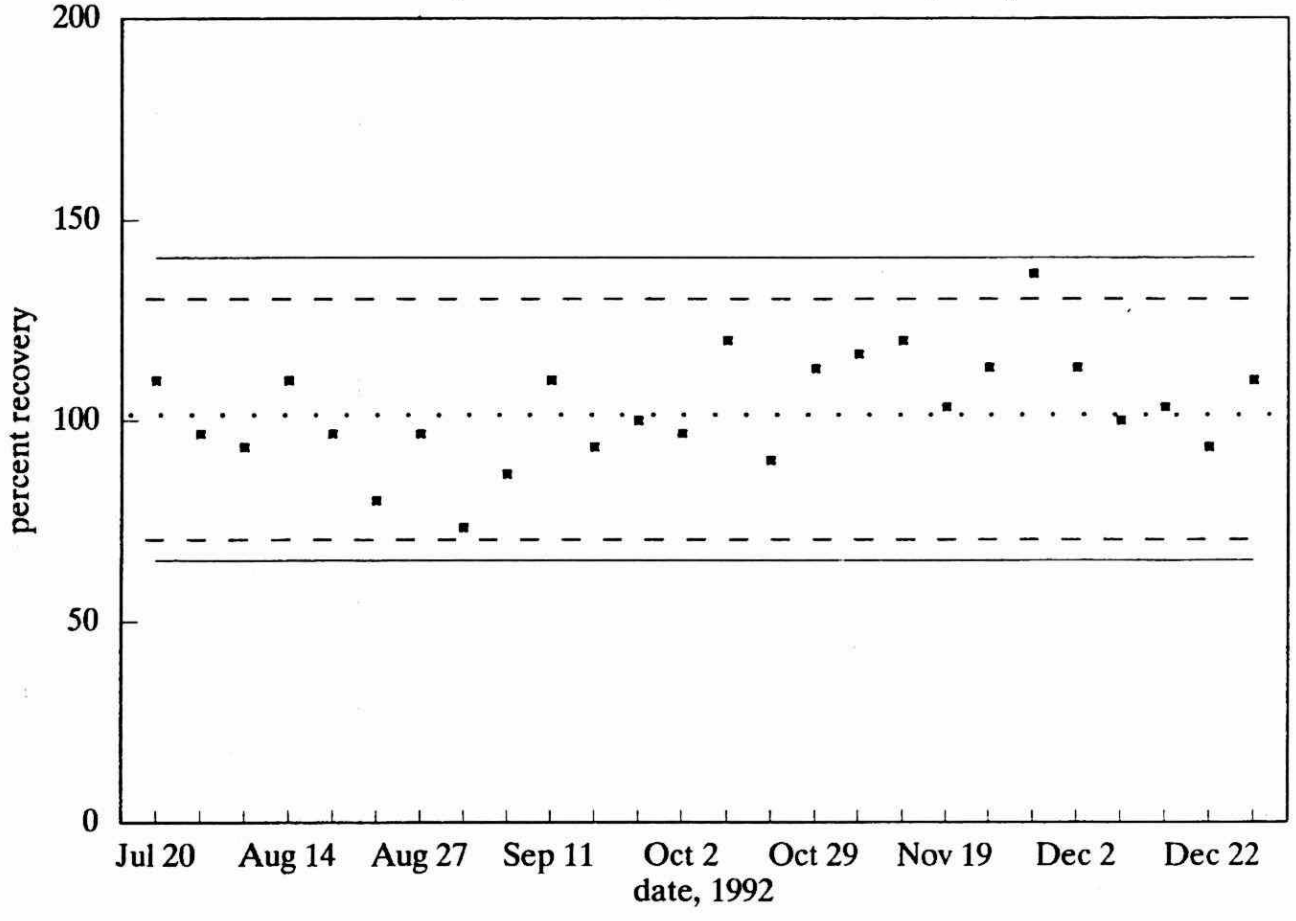
. . . . . average recovery (% of expected)
_____ 99% confidence limits
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	octachlorodibenzo-p-dioxin
True Concentration	300 pg/L
Number of Observations	26
Between-run Standard Deviation	13 %
Accuracy (% of expected)	96 %

2,3,7,8–tetrachlorodibenzofuran

recovery from effluent precision & recovery samples



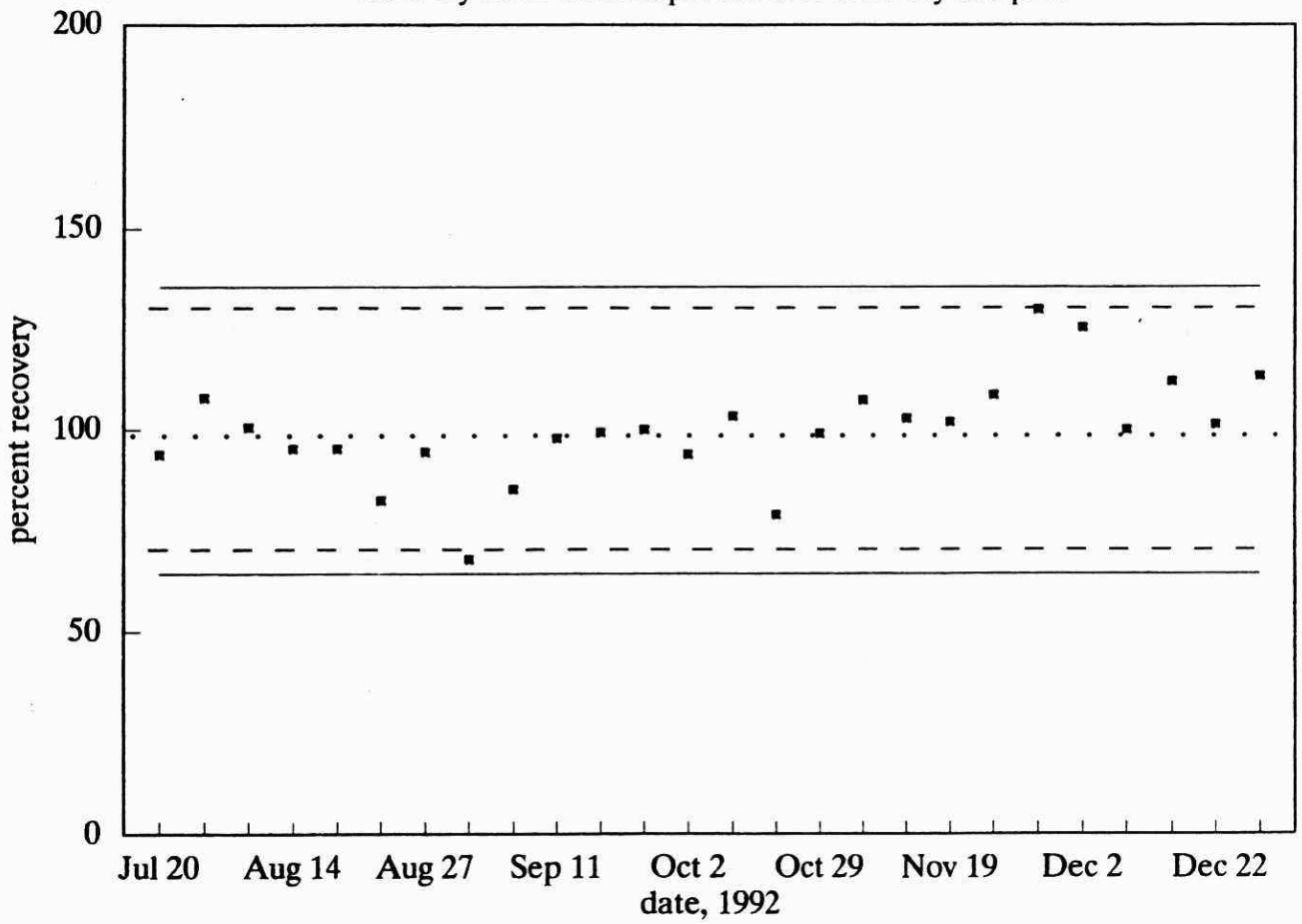
. . . . . average recovery (% of expected)
_____ 99% confidence limits
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	2,3,7,8-tetrachlorodibenzofuran
True Concentration	30 pg/L
Number of Observations	26
Between-run Standard Deviation	14 %
Accuracy (% of expected)	103 %

2,3,4,7,8–pentachlorodibenzofuran

recovery from effluent precision & recovery samples



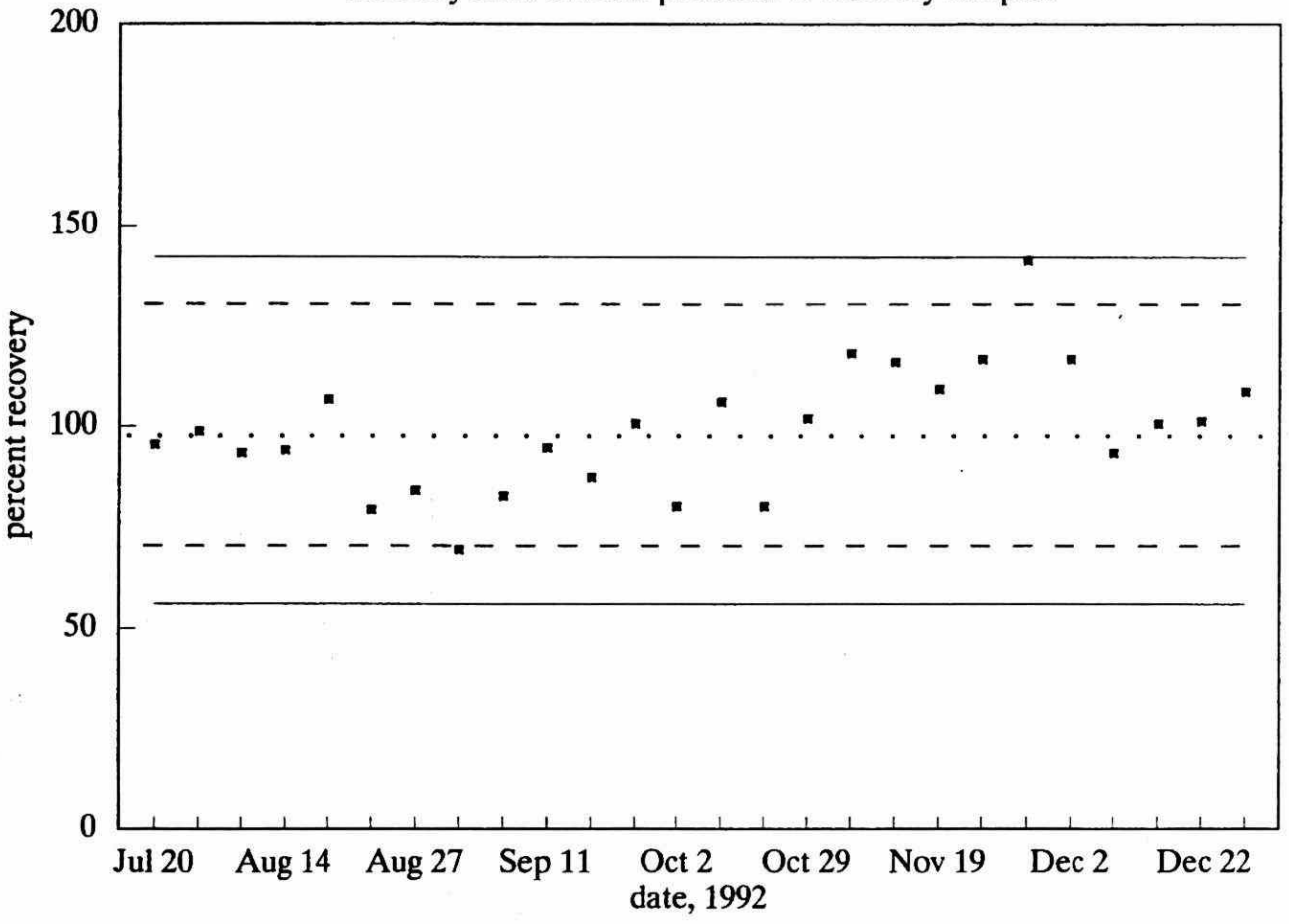
. . . . . average recovery (% of expected)
_____ 99% confidence limits
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	2,3,4,7,8-pentachlorodibenzofuran
True Concentration	150 pg/L
Number of Observations	26
Between-run Standard Deviation	13 %
Accuracy (% of expected)	100 %

1,2,3,7,8–pentachlorodibenzofuran

recovery from effluent precision & recovery samples



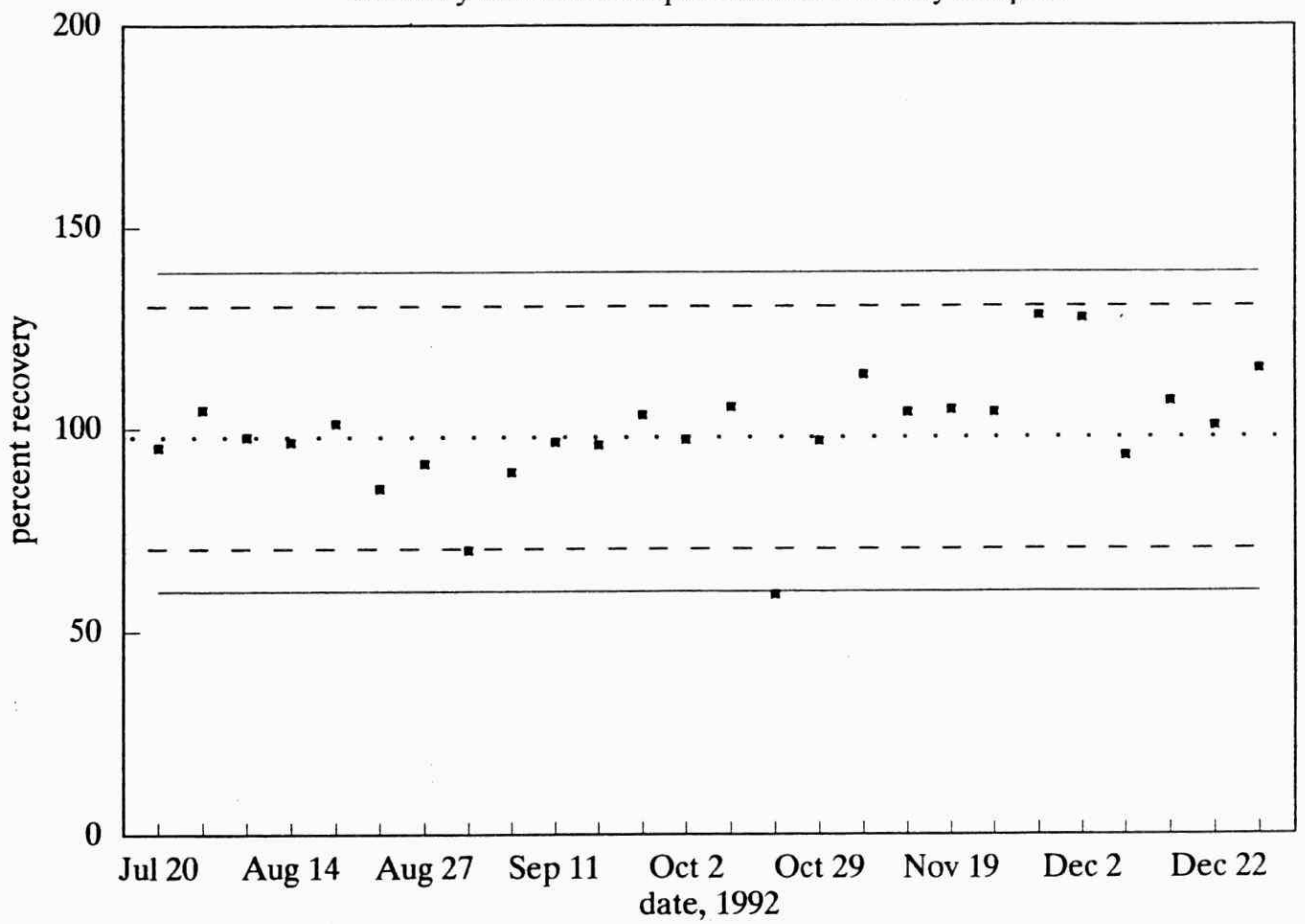
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table January - December 1992

Analyte	1,2,3,7,8-pentachorodibenzofuran
True Concentration	150 pg/L
Number of Observations	26
Between-run Standard Deviation	16 %
Accuracy (% of expected)	99 %

1,2,3,4,7,8–hexachlorodibenzofuran

recovery from effluent precision & recovery samples



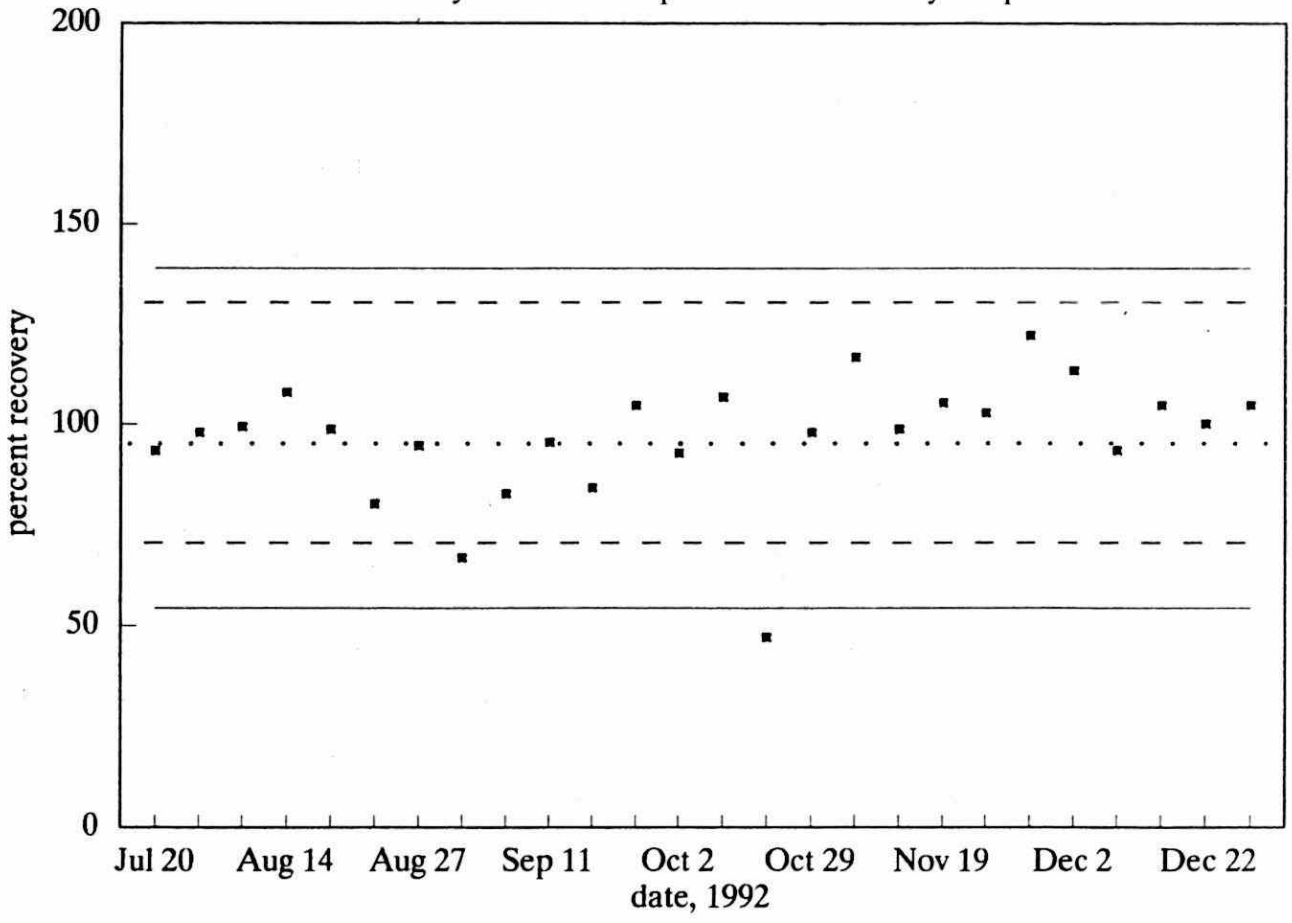
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,4,7,8-hexachlorodibenzofuran
True Concentration	150 pg/L
Number of Observations	26
Between-run Standard Deviation	14 %
Accuracy (% of expected)	99 %

1,2,3,6,7,8–hexachlorodibenzofuran

recovery from effluent precision & recovery samples



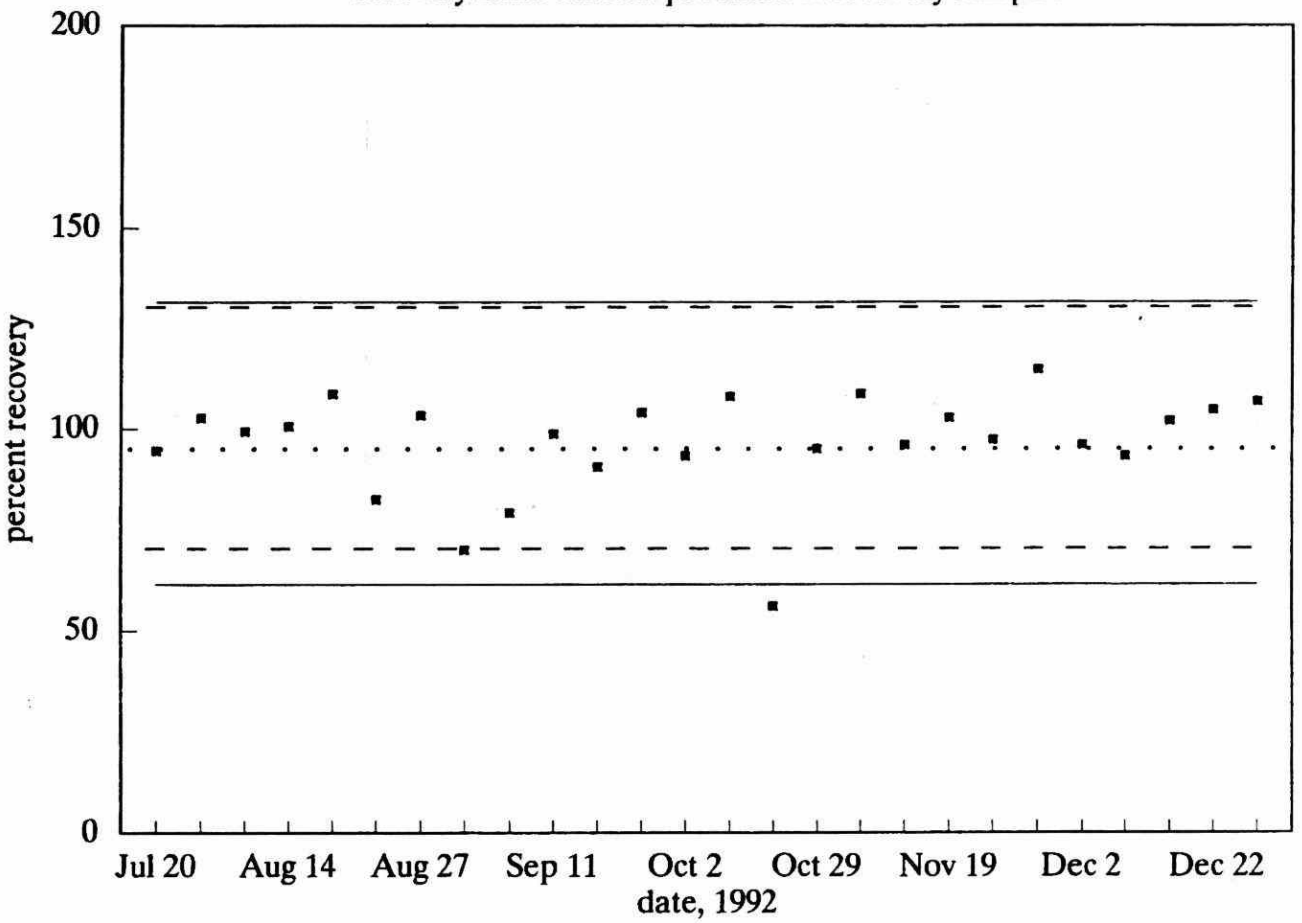
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,6,7,8-hexachlorodibenzofuran
True Concentration	150 pg/L
Number of Observations	26
Between-run Standard Deviation	15 %
Accuracy (% of expected)	97 %

2,3,4,6,7,8–hexachlorodibenzofuran

recovery from effluent precision & recovery samples



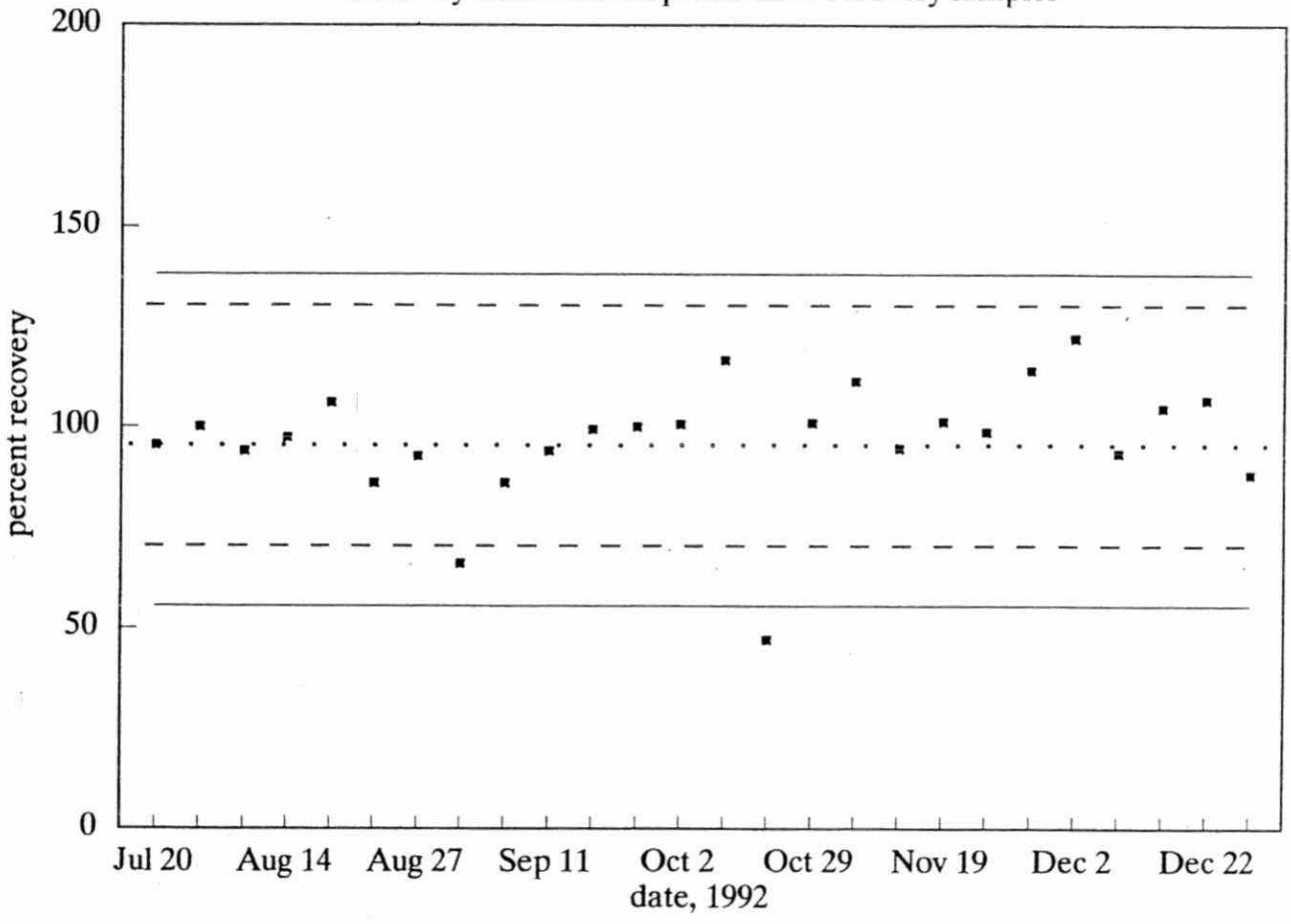
. . . . . average recovery (% of expected)
_____ 99% confidence limits
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	2,3,4,6,7,8-hexachlorodibenzofuran
True Concentration	150 pg/L
Number of Observations	26
Between-run Standard Deviation	13 %
Accuracy (% of expected)	97 %

1,2,3,7,8,9–hexachlorodibenzofuran

recovery from effluent precision & recovery samples



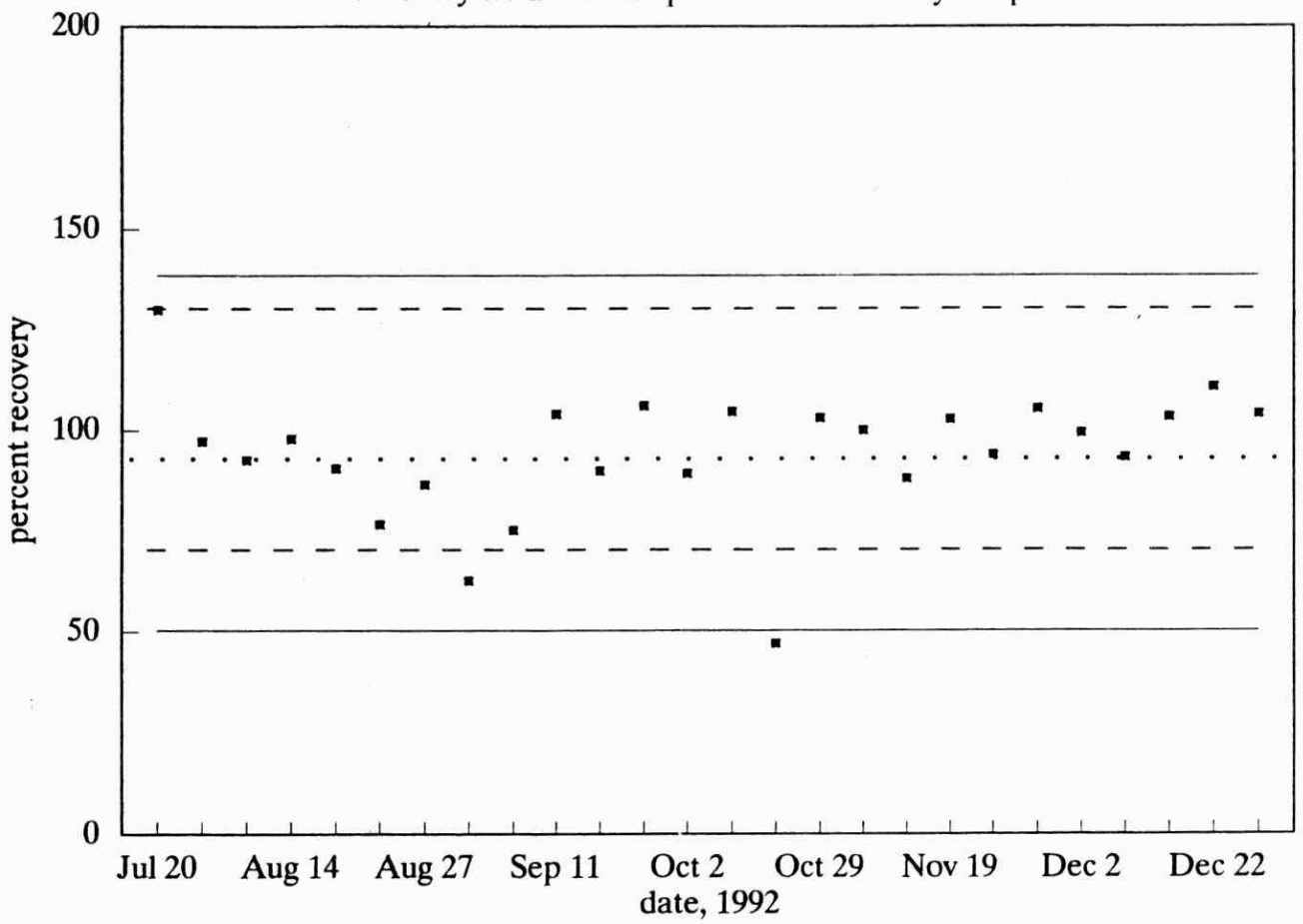
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,7,8,9-hexachlorodibenzofuran
True Concentration	150 pg/L
Number of Observations	26
Between-run Standard Deviation	15 %
Accuracy (% of expected)	97 %

1,2,3,4,6,7,8–heptachlorodibenzofuran

recovery from effluent precision & recovery samples



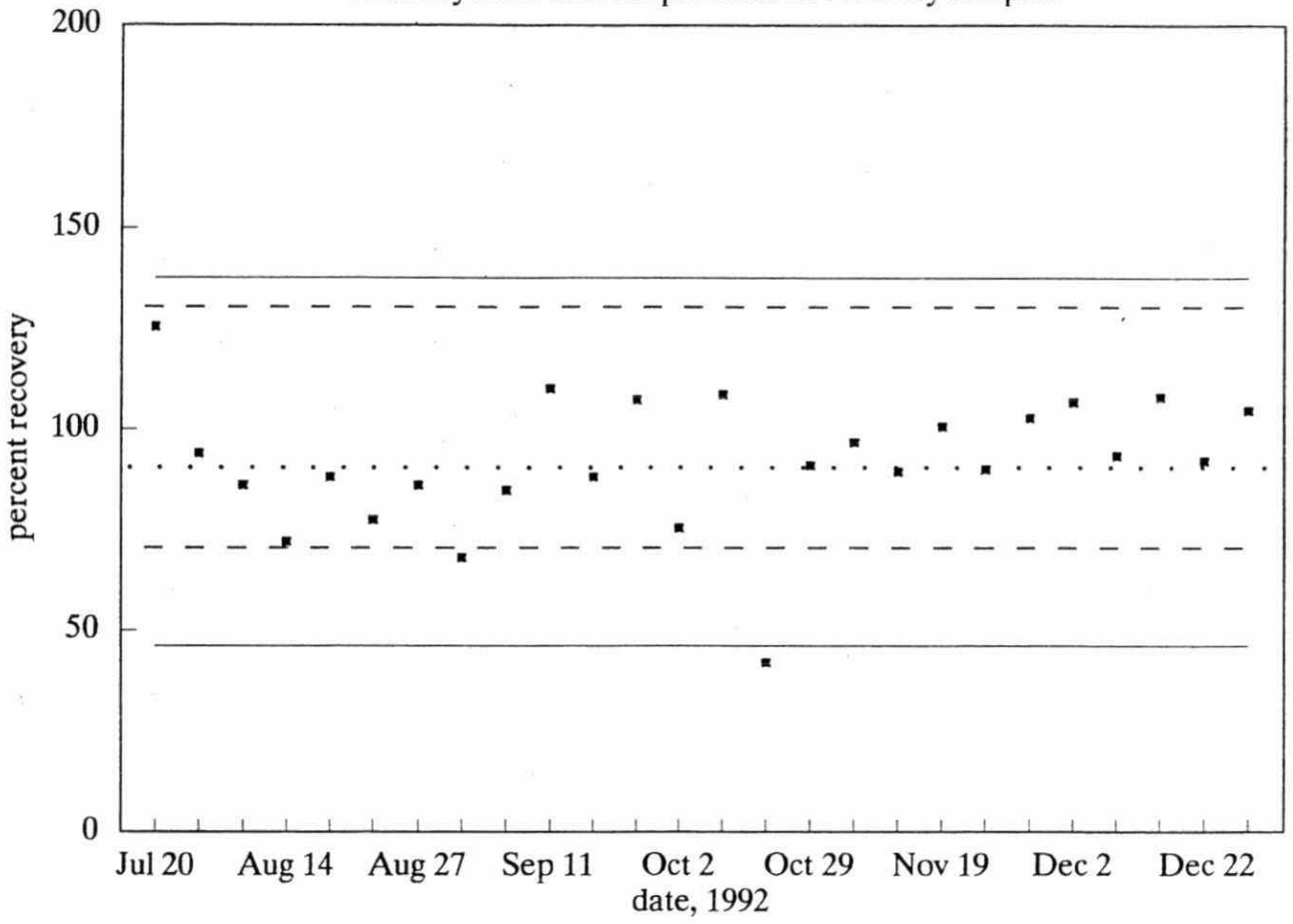
. . . . . average recovery (% of expected)
——— 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,4,6,7,8-heptachlorodibenzofuran
True Concentration	150 pg/L
Number of Observations	26
Between-run Standard Deviation	16 %
Accuracy (% of expected)	94 %

1,2,3,4,7,8,9–heptachlorodibenzofuran

recovery from effluent precision & recovery samples



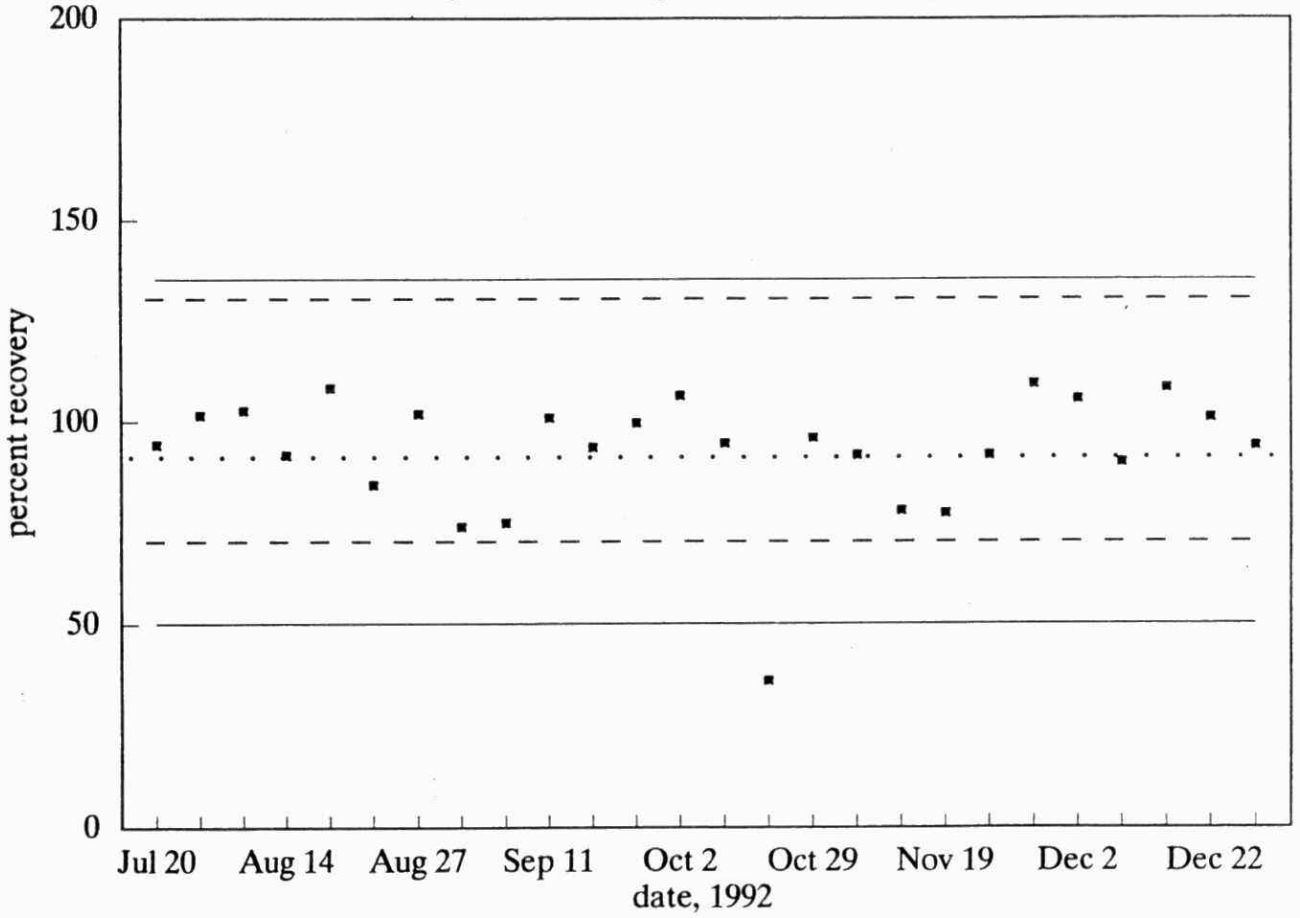
. . . . . average recovery (% of expected)
_____ 99% confidence limits
– – – – – control limits

Performance Summary Table — January - December 1992

Analyte	1,2,3,4,7,8,9-heptachlorodibenzofuran
True Concentration	150 pg/L
Number of Observations	26
Between-run Standard Deviation	17 %
Accuracy (% of expected)	92 %

octachlorodibenzofuran

recovery from effluent precision & recovery samples



. . . . . average recovery (% of expected)
_____ 99% confidence limits
_ _ _ _ _ control limits

Performance Summary Table — January - December 1992

Analyte	octachlorodibenzofuran
True Concentration	300 pg/L
Number of Observations	26
Between-run Standard Deviation	16 %
Accuracy (% of expected)	93 %

METHOD CODE : PVAFD-E3317A
METHOD TITLE: The Determination of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans in Vegetation by GC-MS

LABORATORY : Dioxin Unit
SUPERVISOR : Dr. E. Reiner

SAMPLE TYPE : vegetation

PRINCIPLE OF THE METHOD :

A known quantity of isotopically labelled PCDDs and PCDFs is added to each sample to serve as an internal standard. PCDDs and PCDFs are extracted from the sample using a Soxthlet extraction apparatus and a hexane/acetone mixture. A multi-stage chromatographic cleanup procedure is used to remove potential chemical interferences.

The reconstituted final extract is examined by gas chromatography - high resolution mass spectrometry (GC-HRMS) or gas chromatography/tandem mass spectrometry (GC-MS-MS).

PARAMETERS MEASURED :	**IDL (pg/g)**
2,3,7,8-tetrachlorodibenzo-p-dioxin	1
1,2,3,7,8-pentachlorodibenzo-p-dioxin	2
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	3
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	3
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	3
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	5
octachlorodibenzo-p-dioxin	7
2,3,7,8-tetrachlorodibenzofuran	1
2,3,4,7,8-pentachlorodibenzofuran	2
1,2,3,7,8-pentachlorodibenzofuran	2
1,2,3,4,7,8-hexachlorodibenzofuran	3
1,2,3,6,7,8-hexachlorodibenzofuran	3
2,3,4,6,7,8-hexachlorodibenzofuran	3
1,2,3,7.8,9-hexachlorodibenzofuran	3
1,2,3,4,6,7,8-heptachlorodibenzofuran	5
1,2,3,4,7,8,9-heptachlorodibenzofuran	5
octachlorodibenzofuran	7

total tetrachlorinated dibenzo-p-dioxins (TCDD)
total pentachlorinated dibenzo-p-dioxins (PCDD)
total hexachlorinated dibenzo-p-dioxins (HxCDD)
total heptachlorinated dibenzo-p-dioxins (HpCDD)
total tetrachlorinated dibenzofurans (TCDF)
total pentachlorinated dibenzofurans (PCDF)
total hexachlorinated dibenzofurans (HxCDF)
total heptachlorinated dibenzofurans (HpCDF)

REPORTING FORMAT :

Results are reported in parts per trillion (pg/g) rounded off to 2 significant figures. The minimum reported levels are sample and analyte specific * and range from 1 ppt to 10 ppt.

QUALITY CONTROL :

The routine quality control operations monitor overall method performance (precision and recovery samples), validity of calibration and consistency in injection volume (injection standard), absence of potential contamination (method blanks) and recovery of target analytes (internal quantitation standard).

List of Performance Tables : Method Blanks Summary

Method Blanks Summary January 1992 - December 1992

Analyte	Number of Observations	Average Concentration (pg/g)	Standard Deviation (pg/g)
2,3,7,8-tetrachlorodibenzo-p-dioxin	4	ND (1)	
1,2,3,7,8-pentachlorodibenzo-p-dioxin	4	ND (2)	
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	4	ND (3)	
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	4	ND (3)	
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	4	ND (3)	
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	4	ND (5)	
octachlorodibenzo-p-dioxin	4	9.0	9.0
2,3,7,8-tetrachlorodibenzofuran	4	ND (1)	
2,3,4,7,8-pentachlorodibenzofuran	4	ND (2)	
1,2,3,7,8-pentachlorodibenzofuran	4	ND (2)	
1,2,3,4,7,8-hexachlorodibenzofuran	4	ND (3)	
1,2,3,6,7,8-hexachlorodibenzofuran	4	ND (3)	
2,3,4,6,7,8-hexachlorodibenzofuran	4	ND (3)	
1,2,3,7,8,9-hexachlorodibenzofuran	4	ND (3)	
1,2,3,4,6,7,8-heptachlorodibenzofuran	4	ND (5)	
1,2,3,4,7,8,9-heptachlorodibenzofuran	4	ND (5)	
octachlorodibenzofuran	4	0.9	1.5

ND ... Not detected. Detection limits in pg/g given in brackets ( ).

* The minimum reported levels correspond to the amount of analyte that would give most-abundant ion response five times higher than corresponding instrumental noise.